Chemical Industries

April 1948

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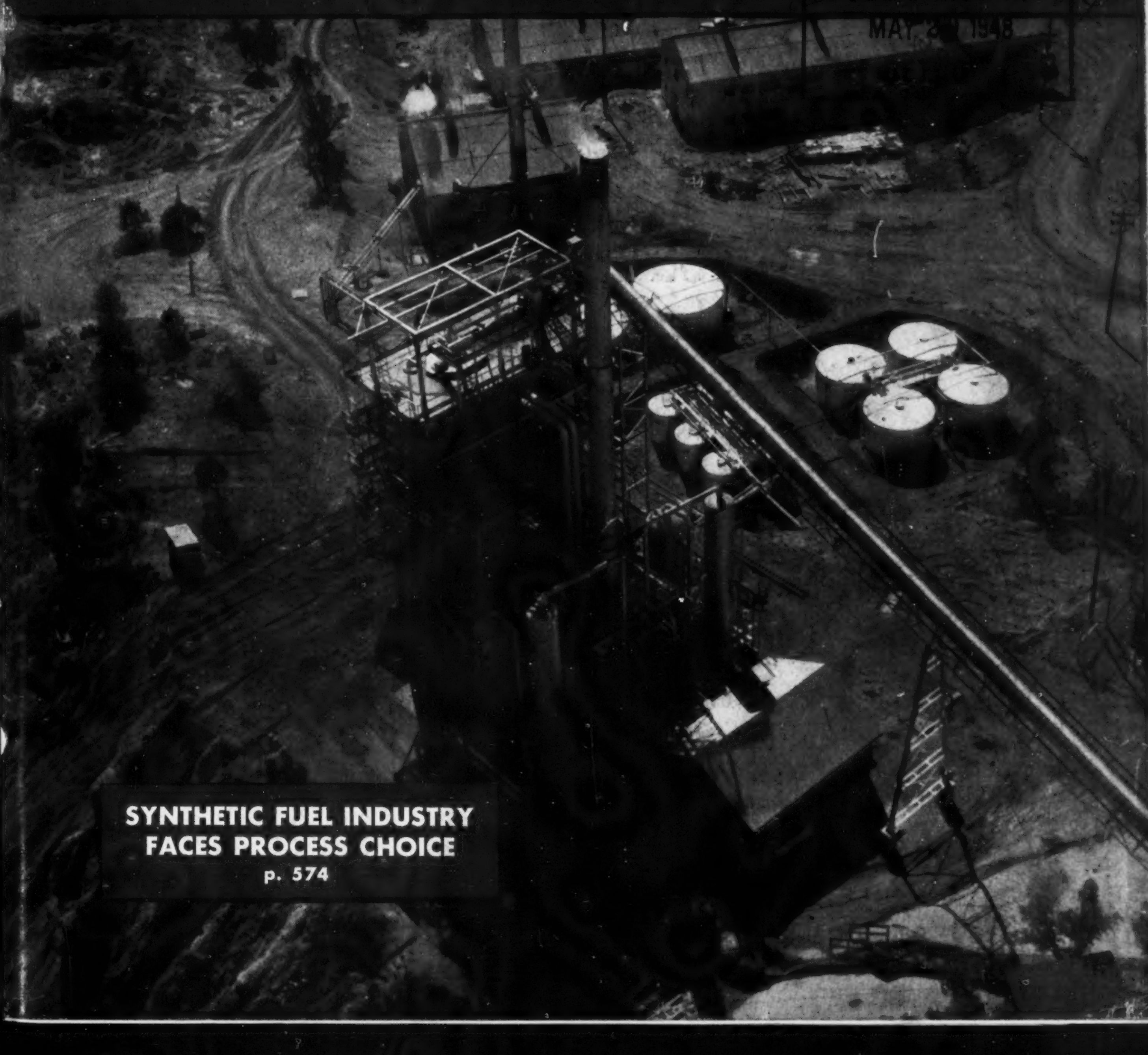

SYNTHETIC FUEL INDUSTRY FACES PROCESS CHOICE

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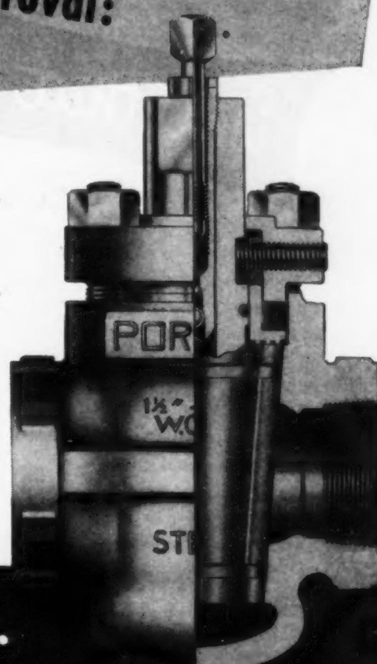

DOUBLE-SEALED PLUG STEM—gives twice the protection against leakage.

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Chemical Industries

"SERVING THE CHEMICAL PROCESS INDUSTRIES"

VOLUME 62—NUMBER 4 APRIL, 1948

What's new 565–573

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Resources Board
Employee Wants
Lion Oil Co.
Utah Coal Resin
Jefferson Chemical Co.
Lithium Chemicals
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Cover: Bureau of Mines, U. S. Dept. of the Interior

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A MACLEAN-HUNTER publication, Horace T. Hunter, President

THE READER WRITES

What Is "Relative Volatility"?

To the Editor of Chemical Industries:

We read with interest Mr. D. S. Davis' column for November 1947, presenting a nomograph for relative volatility of mixtures of solvents.

We would appreciate having his interpretation of the term "relative volatility" as he used it in the discussion, since the term is unfamiliar to us. Are the values obtained related to an absolute standard or to one of the components?

CHARLES W. HEIDEL
W. P. Fuller & Co.
South San Francisco, Calif.

To The Editor of Chemical Industries:

May I offer the following on the questions raised in Mr. Heidel's letter.

Ideal relative volatility, as applied to binary mixtures that follow Raoult's Law, is defined as the ratio, at the same temperature, of the vapor pressure of the more volatile to that of the less volatile component. Thus, in paragraph 2 of our paper (carbon copy attached) the vapor pressures of benzene and toluene at 100° C. are 1344 and 557mm. respectively. The ideal relative volatility α_i, is 1344/557 or 2.41.

True relative volatility (α_t) must be calculated from liquid vapor equilibrium data from the equation

$$\alpha_t = \frac{y(x-1)}{x(y-1)}$$

where x and y are the mole fractions of more volatile component in the liquid and vapor phases respectively. For the system benzene-toluene at 100° C., x = 0.256* and y = 0.453, so that

$$\alpha_t = \frac{0.453}{0.256} \frac{(0.256-1)}{(0.453-1)}$$

$$= \frac{0.453}{0.256} \frac{(0.744)}{(0.547)}$$

$$= 2.41$$

You will note that, in this case, the ideal and true relative volatilities α_i and α_t are equal since both benzene and toluene follow Raoult's Law rather closely.

"Are the values obtained related to an absolute standard or to one of the components?"

Relative volatilities then, are based on the least volatile component rather than on an absolute standard.

DALE S. DAVIS
University of Akron
Akron, Ohio

*Perry, "Chem. Eng. Handbook," New York McGraw-Hill, 2nd ed., p. 1377.

Protect Trademarks

To the Editor of Chemical Industries:

In a great many cases where trademarks are used in scientific and other literature, the trademarks are not capitalized or set in quotation marks. One unaware of the facts might readily conceive the trademark to be merely a descriptive term. We wish to call your attention to this situation, and suggest a uniform manner of identifying all trademarks where they appear in published articles.

The trademark is a valuable property right of the manufacturer, and once adopted, its value depends upon keeping it in use as a trademark. We are all aware of the fact that the trademarks "Aspirin" and "Cellophane" were lost through appropriation of these marks by the public. They became a part of the common language. This could have been prevented, in part at least, if in use these two terms had always been clearly identified as trademarks.

The practice of using trademarks to indicate the source and the genuineness of chemicals and pharmaceuticals has increased significantly in recent years. Under such circumstances, it is natural that trademarks appear with increasing frequency in the literature.

A trademark is properly identified as such if it begins with a capital letter, or is placed in quotes.

It is usually possible to recognize a trademark if one remembers that most coined terms applied to brands of drugs or to newly developed chemicals have trademark characteristics. For the purpose of protecting property rights, it is always better to be on the safe side by regarding a coined word as a trademark rather than as a term in the public domain.

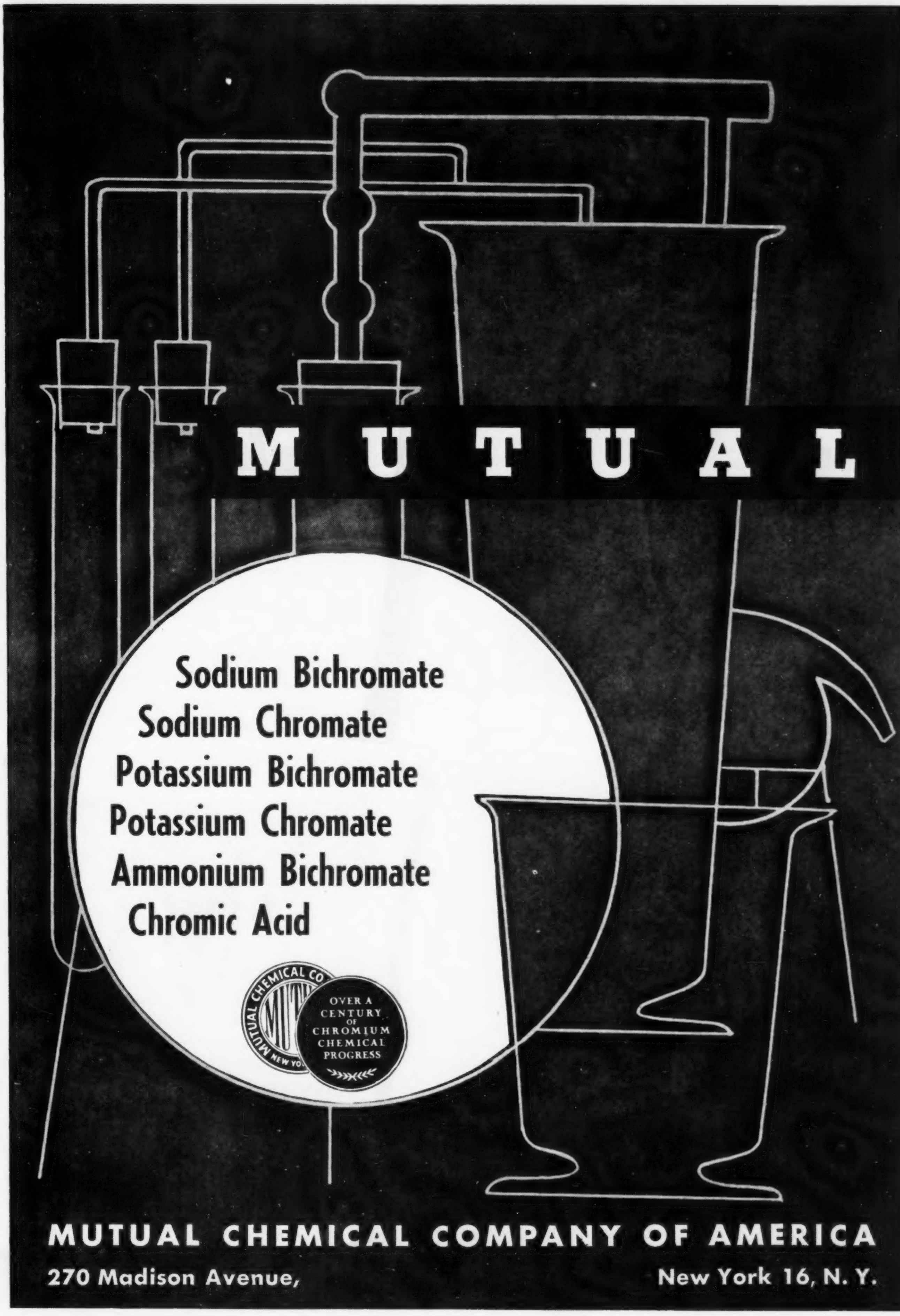
CARSON P. FRAILEY
American Drug Mfrs. Assoc.
Washington, D. C.

Fair Representation

To the Editor of Chemical Industries:

I find your write-up "McCarthy Unveils" (Chemical Industries, February, 1948), a fair representation of what the McCarthy organization is trying to do with their Texas plant.

JOSEPH E. BLUDWORTH,
Corpus Christi, Texas.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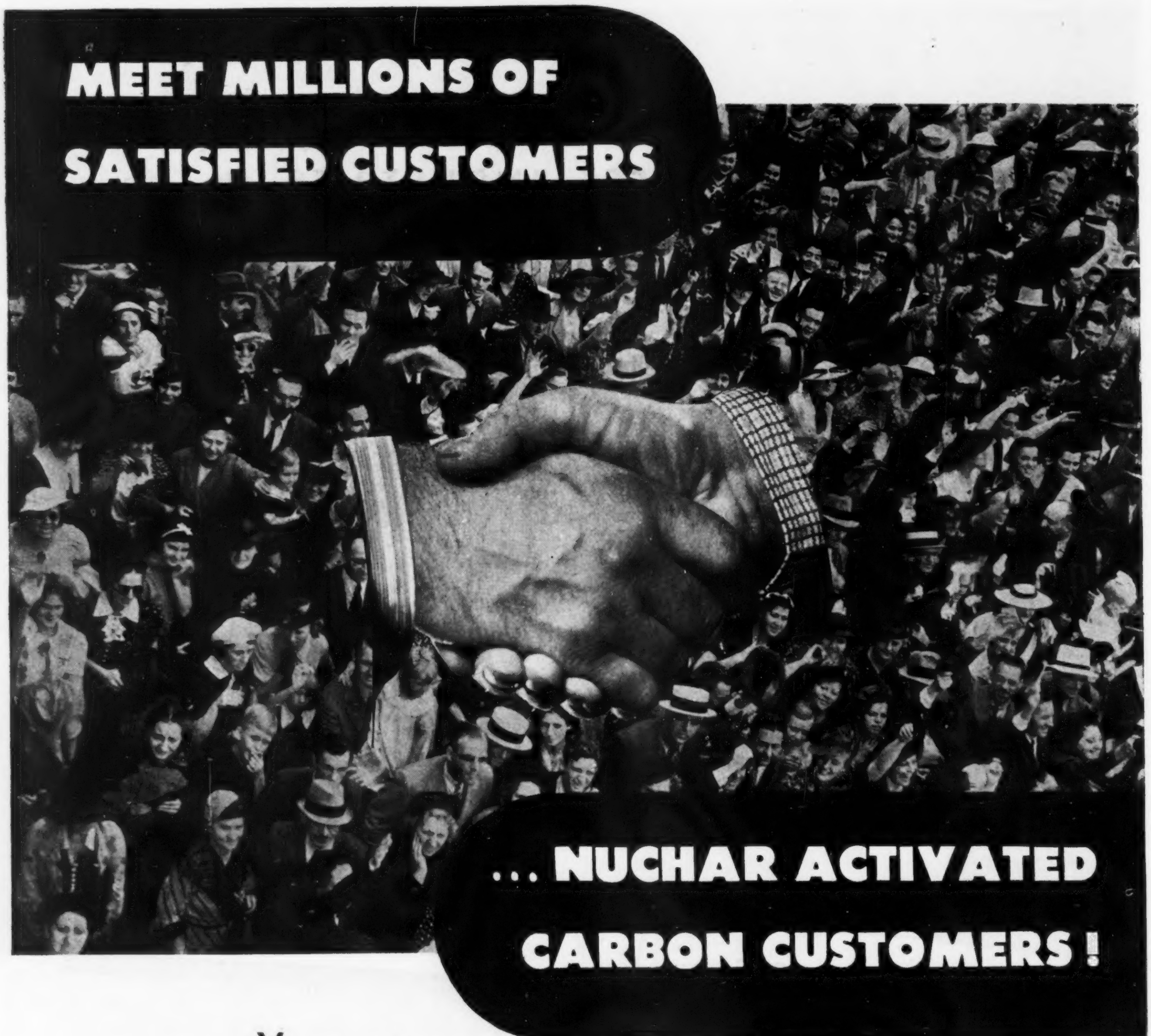

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For further information on the many uses and advantages of Saccharin Monsanto, send for a copy of the new folder, "Saccharin Monsanto . . . The Perfect Sweetener." Write to Monsanto Chemical Company, Organic Chemicals Division, 1703 South Second St., St. Louis 4, Missouri. Ask for it on the coupon if more convenient.

Preserving with Sodium Benzoate

A new folder on Monsanto Sodium Benzoate, U.S.P., contains many valuable suggestions for food processors who want to insure maximum storage and shelf-keeping qualities in their fruit juices, jams, jellies, preserves, pickles, relishes, fountain syrups and margarine.

Monsanto Sodium Benzoate, U.S.P., imparts no objectionable taste, does not affect the nutrient value of foods and is completely harmless to human beings. The one preservative for food products permitted by Federal Law, Sodium Benzoate also has important applications in the industrial field. If you are interested in utilizing this product to the best advantage, write for a copy of "Preserving with Monsanto Sodium Benzoate." Use the coupon if you prefer.

No matter what plasticizer or resin you may now be using — whether for plastics or protective coatings — you will be interested in looking into the wide potentials of Santolite MHP.

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Di-Tertiary-Butyl Peroxide

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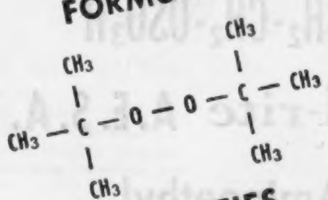

PROPERTIES

Molecular Wt.	146.22
Boiling Pt. (760 mm)	111°C
Spec. Gravity 20°/4°C	0.800
Refr. Index, n_D^{20}	1.389
Flash Pt. (Tag Open Cup)	65°F
Solubility in water, 20°C (wt.%)	<0.1%

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DTBP is soluble in most resin-forming monomers. It is an effective catalyst in polymerization reactions carried out at temperatures above 100°C.

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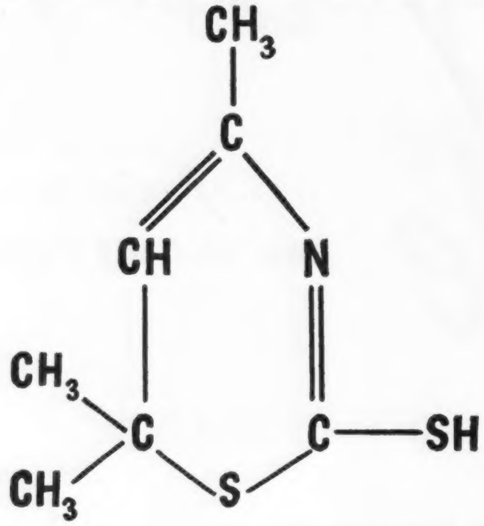
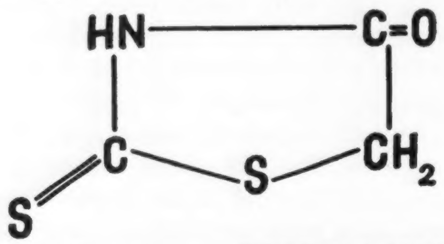


Good-rite M.T.M.T.

2-Mercapto-4,6,6-Trimethyl Thiazine

As an intermediate, M.T.M.T. is expected to find many applications in the manufacture of wetting agents, pharmaceuticals, and other specialty chemicals not heretofore possible. As a new composition of matter, its chemical structure will suggest utility in a wide variety of fields.



Good-rite RHODANINE

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SO_2	0.2% max.
H_2SO_4+$HFSO_3$	0.1% max.

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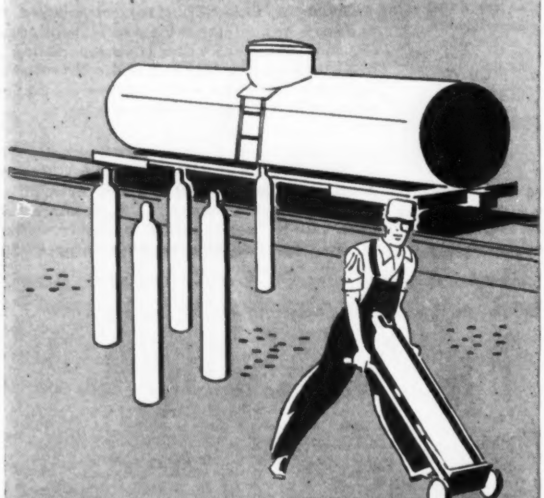

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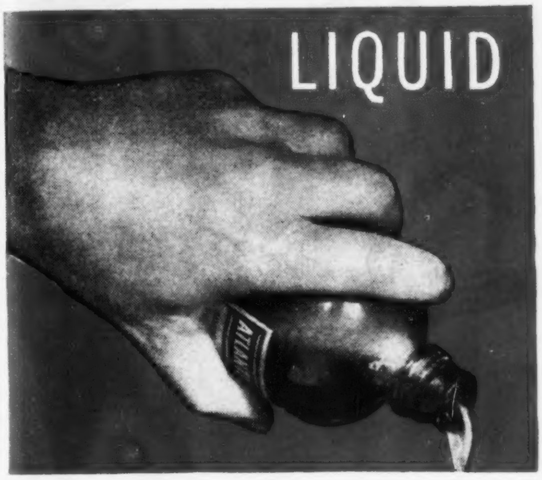

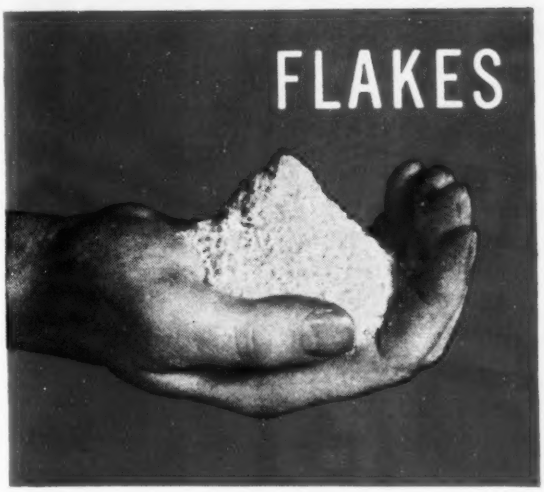

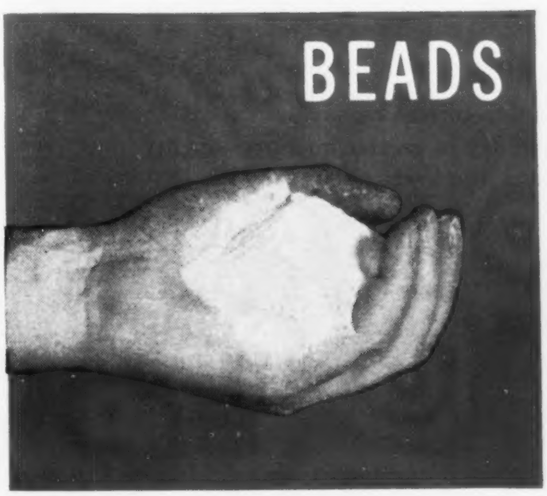

Ultrawet K's

Have you tried these new high-quality, low-cost detergents?

The superior wetting, sudsing and detergent properties of Atlantic's new K series Ultrawets offer distinct advantages for cleaning compounds, cosmetics and many industrial processes.

Ultrawet K's are more efficient than soap, especially in hard water, and their low prices make them more economical. *They eliminate the trouble and expense of water softening.*

Ultrawet K's are immediately available in three different forms—liquid, flakes, and beads. As a liquid, they are pale amber in color and odorless (no kerosene or sludge odor). As flakes and beads, they approach the compounder's ideal of whiteness and lack of odor.

The latest Atlantic development in alkyl aryl surface-active agents, Ultrawet K's are produced by an organization that has been producing detergents and wetting agents for over 10 years. They are backed by Atlantic's great research facilities. Here are the physical data:

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Wt. % Active Sulfonate—min.	**85**	**25.5**	**35**

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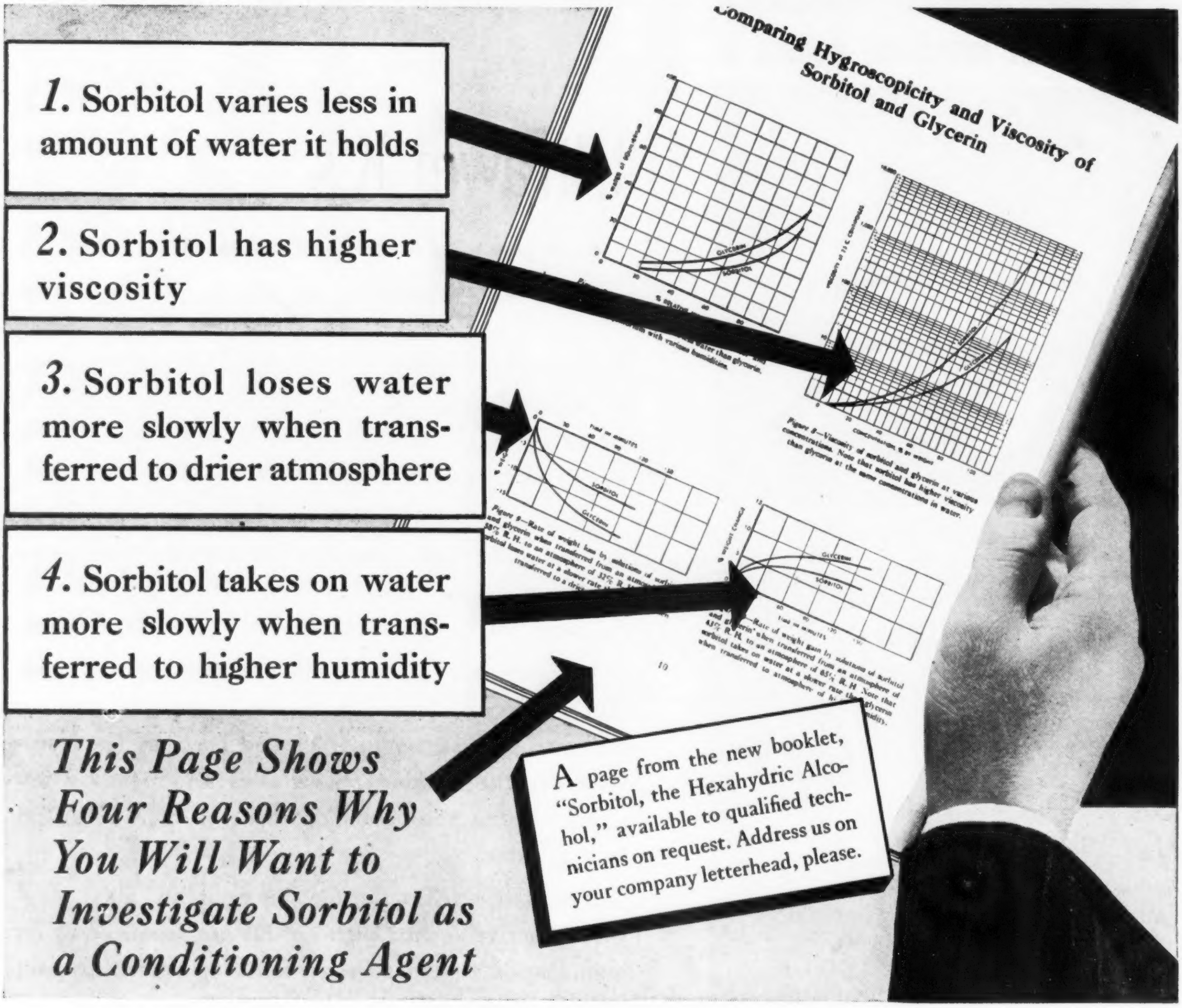

Other pages show superiority of sorbitol in making drying oils, hard resins, alkyds, emulsifiers and many derivatives.

Sorbitol is a polyhydric alcohol with many unique properties of its own which make it especially valuable in certain types of processing and synthesizing.

New manufacturing techniques make it available today in greater quantity—higher purity—and at a lower price than ever.

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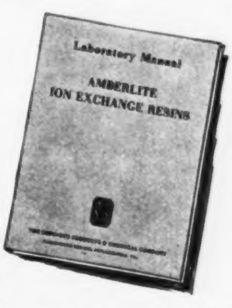
For special chemical processes . . . for softening or complete deionization of water...investigate the AMBERLITES. Our staff will be glad to discuss possible uses.

A Starting point for your Amberlite thinking



Our "Laboratory Manual on the AMBERLITES" will suggest to you many interesting applications of these Ion Exchange Resins in your industry. For your copy of this manual, address The Resinous Products & Chemical Co., Dept. CE-6, Washington Sq., Philadelphia 5, Pa.

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THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

 Prepared Monthly by U. S. Industrial Chemicals, Inc.

U.S.I. CHEMICAL NEWS

April ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1948

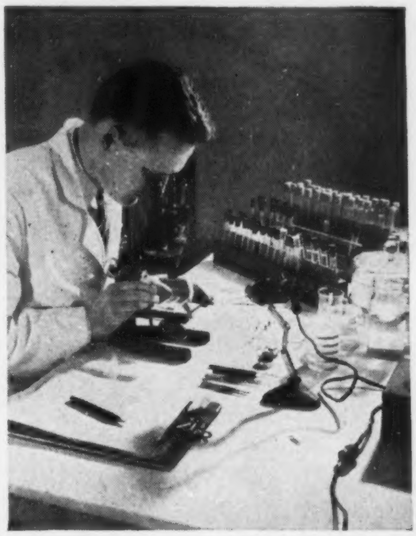
First 'Grain Itch' Outbreak In Baltimore Stopped by Aid Of New Insecticide Material

Piperonyl Butoxide Used To Control Insect Mite

The owner of a local broom factory in Baltimore, Maryland, recently called on the City Health Department's Division of Industrial Hygiene for aid in controlling a peculiar rash that had suddenly appeared among his employees. The rash was described as itching intensely for about 24 hours, and appeared only on the clothed portions of the body, chiefly about and above the waist. It resembled chickenpox to some extent, and remained on the skin for a week or ten days after exposure.

Example of Medical Detection

Tracking down the cause of this dermatitis



CAUSE OF MYSTERIOUS MALADY affecting Baltimore industrial workers was tracked down with aid of U.S.I. entomologists. A U.S.I. chemical brought about complete control of the disease.

was a remarkable example of medical detection. Examination of the symptoms suggested to the Health Department's dermatologist that the outbreak might be the rare "grain itch," described in Ormsby's "Diseases of the Skin," and caused by the insect mite known as *Pediculoides ventricosus.*

At this stage of the investigation, the Bureau of Industrial Hygiene called in a leading entomologist attached to the insecticide research laboratory of U.S.I. in Baltimore. With the aid of this expert and his assistants, the mites were identified as those described by Ormsby – and it was also found that the Angounois grain moth, one of the normal hosts for the parasitic mite, was present as well. The insects were apparently brought into the plant on broom corn which probably became infested in a freight car previously used to transport grain.

Control Measures Taken

Upon identification of the cause of the outbreak, the plant

MORE

THE AMERICAN HYDROCARBON SYNTHESIS: IV

American Version of Hydrocarbon Synthesis Replaces Older Methods

Improvements Permit Production of Oxygenated Chemicals, Fuels at Costs Competitive With Other Processes

To American engineering skill, we owe the conversion of "hydrocarbon synthesis" from intricate intermittently operating units to large continuous ones—from the removal, regeneration and recharging of a catalyst to its continuous reactivation – and from operations that were wasteful of manpower to operations susceptible to automatic control. Improvements permit the production of fuels and oxygenated chemicals at costs competitive with other sources. Oxygenated chemicals from the American hydrocarbon synthesis – alcohols, ketones, and acids – will be made available by U.S.I.

Takes Clue From Petroleum Engineers

A large part of the technological deficiencies in the older method has been eliminated in the American hydrocarbon synthesis process by stealing a page from the petroleum engineer's notebook. In catalytic cracking, our petroleum refiners faced the problem of bringing gaseous material in contact with solid catalysts while adding heat to the reaction rather than removing it – a problem faced by chemical engineers in dealing with the hydrocarbon synthesis. Problems of uniform gas distribution over the catalyst, uniform temperatures, prevention of "hot spots," and catalyst regeneration troubled them, too. In solving these puzzles, they made a notable contribution to chemical technology – the Fluid Catalyst Technique. This technique has been applied to the hydrocarbon synthesis reaction and, although much has been written concerning the technique itself, a brief

MORE

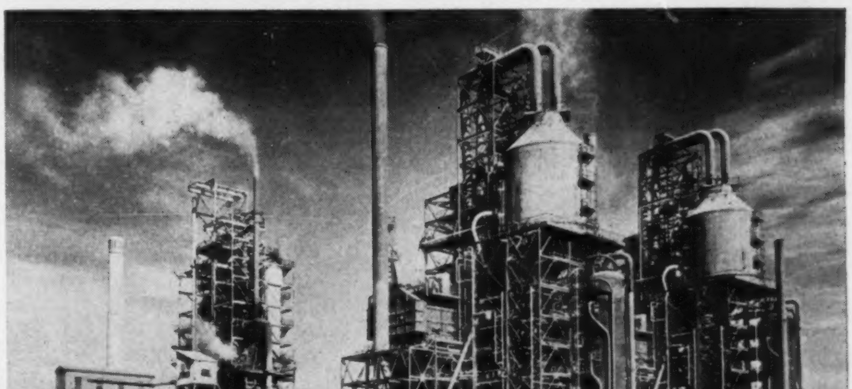
New Method for Synthesis Of Alkylmalonic Esters

A procedure is reported in a recent issue of an American scientific journal for the condensation of oxalic esters with fatty acid esters up to stearic. Up to the time of publication, condensation of oxalic esters with fatty acids up to only butyric acid had been described.

In the current study, it is found that by removing by-product alcohol in Claisen condensations involving ethyl oxalate, and by adjusting the relative amounts of ethyl oxalate to fatty acid ester in these reactions, it becomes possible to obtain excellent yields of alpha-ethoxalyl esters. These esters are thermally decarbonylated to give high yields of alkylmalonic esters.

Rapid Sulfate Assays

The availability of pure tetrahydroxyquinone points the way to more rapid sulfate determinations, it was announced recently. This chemical is an indicator in the volumetric determination of sulfates by direct titration with barium chloride solutions. Tetrahydroxyquinone was formerly not generally available.



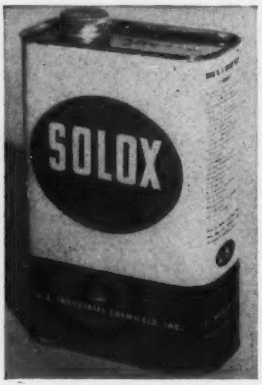
CLUE TO IMPROVED HYDROCARBON SYNTHESIS was found in catalytic cracking plants. Taking a leaf from the petroleum engineer's book, American chemical engineers adapted the "Fluid Catalyst Technique" to hydrocarbon synthesis . . . helped make the method competitive with others.

April ★ **U.S.I. CHEMICAL NEWS** ★ 1948

Methionine Protects Rats Against Liver Poisoning

Damage to rats' livers produced by diets containing pyridine may be avoided by the application of DL-methionine, it was announced in a scientific paper published recently. The paper, the third in a series exploring the mechanism of liver and kidney injury, adds further data to the growing body of proof concerning the detoxifying action of methionine. With increased production by U.S.I. of low cost synthetic DL-methionine, in addition to a newly announced price cut, the product has become available for bulk shipments for pharmaceutical manufacturing and commercial consumption.

New Convenient Sizes



Solox, U.S.I.'s popular proprietary alcohol-type solvent for general use, is now packaged in two new sizes: quarts and pints. The quart containers are supplied to dealers in cases of 24, the pint containers in cases of 48.

CONTINUED 'Grain Itch' Outbreak

was sprayed with piperonyl butoxide, one of U.S.I.'s new insecticides which is deadly to insects, but harmless to all warm-blooded animals. The use of piperonyl butoxide rapidly destroyed the insects, completely eradicating the disease.

CONTINUED Hydrocarbon Synthesis

description is warranted.

Fluid Catalyst Technique

The technique derives its name from the "fluidization" of solid particles. When finely ground catalyst is suspended in a gas stream, the particles are carried along with it. They can be moved as suspensions through pipes and valves, and held in reaction and catalyst reactivation chambers as a turbulent—"boiling"—mass with the appearance, and some of the properties, of a liquid. Reacting gases are used to carry the catalyst powder upward into the large cylindrical catalyst chamber or reactor. The solids can be separated from the reaction products by a cyclone separator through which pass the produced gases. Heat is removed by cooling water tubes, but these, because of the improved heat transfer due to turbulence, can be larger and fewer.

But the catalyst must be reactivated by burning off the carbon which forms. To do this, the catalyst is drawn continuously from the reactor into a stream of pre-heated air which carries it to the reactivator. The reactivator is a large cylindrical vessel like the catalyst chamber, and the "fluid" solid is in the same turbulent state. In both cases, the "boiling" catalyst bed eliminates "hot spots," saves equipment, and results in more uniform product. Catalyst regeneration is continuous and is accomplished without dismantling of equipment, or removing and recharging catalyst. Capacity per unit is multiplied many times.

Adapt Iron Catalyst

To the Fluid Catalyst Technique, American engineers have adapted an iron catalyst for the synthesis reaction. This material possesses properties which make it a great improvement over the German catalyst. It has greater mechanical strength, and, of most importance, a greatly reduced cost. Moreover, its use results in the production of oxygenated chemicals.

Rot-Resistant Cotton

The best means yet discovered for protecting cotton fabric and yarn from mildew and other forms of rot is to convert part of the fiber chemically to cellulose acetate, similar to acetate rayon, it was reported recently by a government research bureau.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

A new coating compound for spray booths is said to form a continuous white coating to which overspray adheres. To clean the booth, the coating plus adhered paint is easily removed by scraping, or by flushing with hot or cold water, the manufacturer states. **(No. 305)**

A new refrigeration sealer, described as odorless, resilient, moisture- and vapor-proof, and sufficiently pliable to resist normal impact and torque action, is claimed to be useful on all types of food cabinets and refrigeration equipment. **(No. 306)**

A "photo plastic" that can be cast in chunks from 10 to 20 times larger than any other resin of this type, can be molded and cut into exact models of industrial tools or machine parts, then tested under stress to aid in the design of machinery. A unique alleged property of this plastic is that it "freezes" stress patterns. **(No. 307)**

A non-curling carbon paper is claimed to be over one-third stronger than the ordinary carbon paper, and to possess greater moisture resistance and flexibility. **(No. 308)**

Resins made from cashew nuts are described in a new booklet. The resins are alleged to be useful for laminating, waterproofing, for friction fortifiers in brake linings and clutch facings, and for many other industrial applications. **(No. 309)**

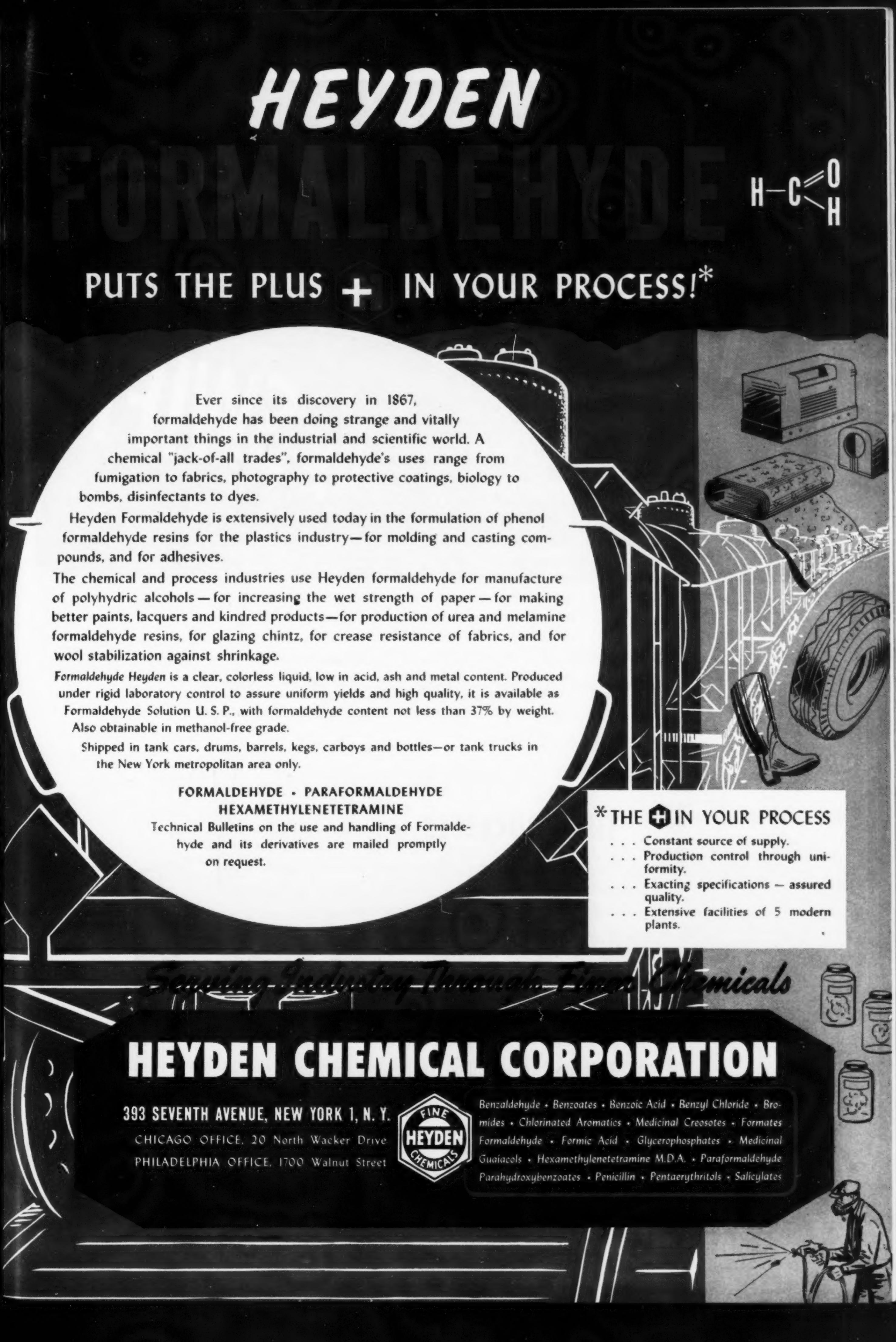
To determine the friction qualities of yarn, a new lubricity tester has been placed on the market which is claimed to establish the quantitative relationship between coefficient of friction and abrasion resistance. **(No. 310)**

A new non-injurious cold paint stripper, claimed to remove paints, lacquers, enamels, synthetics, and wrinkles almost instantly, is said to require no neutralizing action other than wiping with a rag. **(No. 311)**

To determine the presence of carbon monoxide, a new instrument has been developed which requires no special training to use and is capable of indicating the presence of carbon monoxide from 0.001 to 0.10 per cent by volume in air, according to the manufacturer. **(No. 312)**

A pocket alarm watch, no larger than the ordinary pocket watch, contains an accurate bell-alarm which may find wide use in industry, the makers state. **(No. 313)**

To detect small amounts of oxygen in organic compounds, a new apparatus has been invented. It is said to make use of the decomposition of a weighed sample by heating in an atmosphere of oxygen-free helium. **(No. 314)**


HEYDEN
FORMALDEHYDE
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PUTS THE PLUS + IN YOUR PROCESS!*
Ever since its discovery in 1867, formaldehyde has been doing strange and vitally important things in the industrial and scientific world. A chemical "jack-of-all trades", formaldehyde's uses range from fumigation to fabrics, photography to protective coatings, biology to bombs, disinfectants to dyes.
Heyden Formaldehyde is extensively used today in the formulation of phenol formaldehyde resins for the plastics industry—for molding and casting compounds, and for adhesives.
The chemical and process industries use Heyden formaldehyde for manufacture of polyhydric alcohols—for increasing the wet strength of paper—for making better paints, lacquers and kindred products—for production of urea and melamine formaldehyde resins, for glazing chintz, for crease resistance of fabrics, and for wool stabilization against shrinkage.
Formaldehyde Heyden is a clear, colorless liquid, low in acid, ash and metal content. Produced under rigid laboratory control to assure uniform yields and high quality, it is available as Formaldehyde Solution U. S. P., with formaldehyde content not less than 37% by weight. Also obtainable in methanol-free grade.
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of great purity
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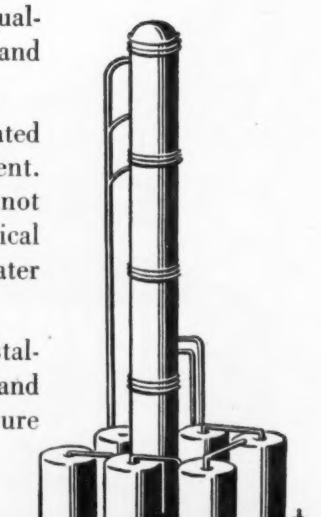
Swift & Company is now inviting inquiries on its new lines of fatty acids and fractionated glycerides. Extensive use of solvent processes will make possible new high standards of purity and stability.

1 THE PROCESSES

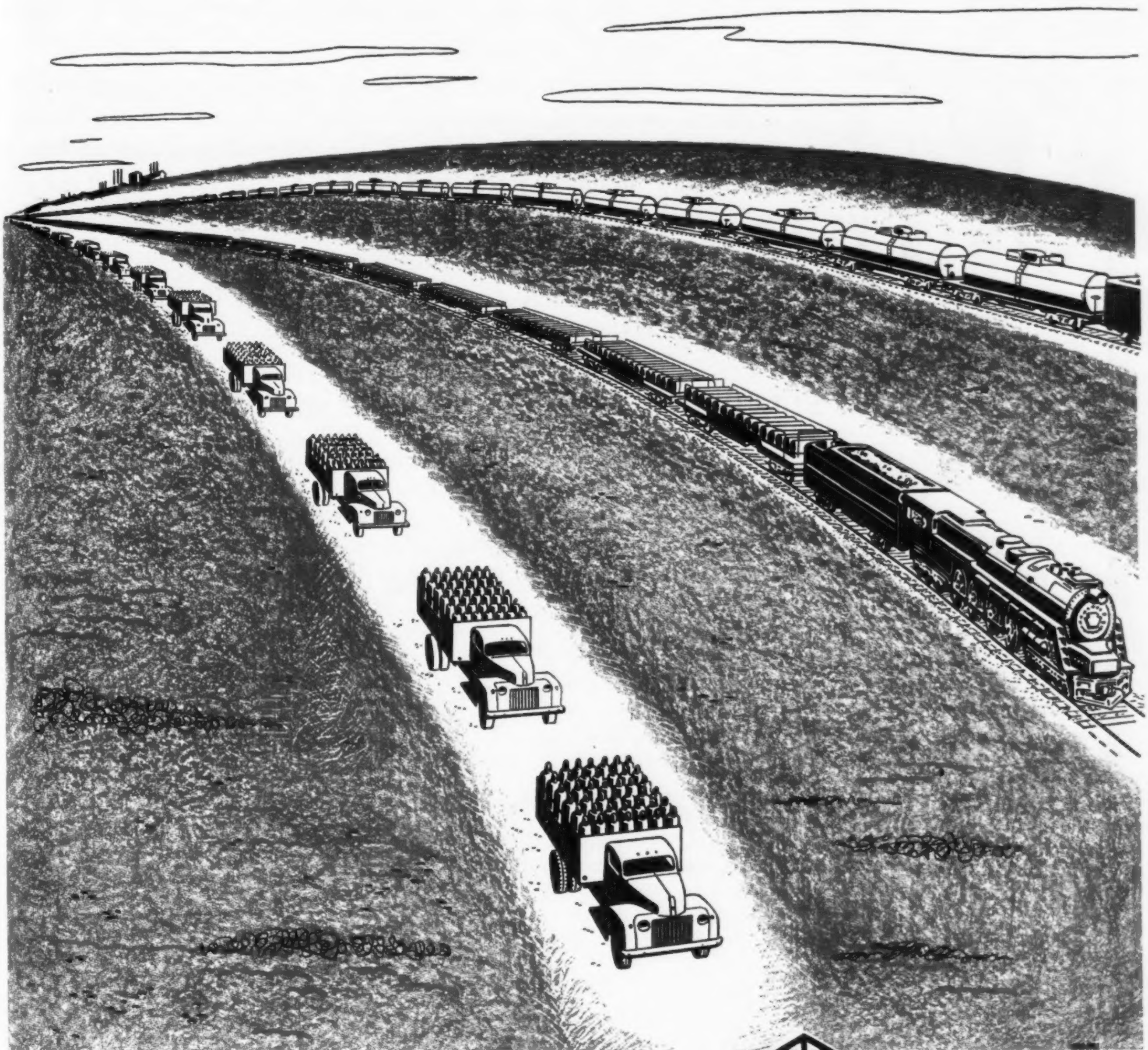
Solvent processes yield fat fractions of a higher quality and wider usefulness. Most of Swift's new fats and fatty acids will be processed with solvents.

Unsaturated acids and drying oils will be separated by the Solexol process, using propane as a solvent. Fractions are separated selectively at temperatures not exceeding 200 degrees F. Since thermal and chemical side reactions are thereby avoided, products of greater purity and stability are obtained.

Saturated acids will be fractionated by solvent crystallization. Here, too, processing temperatures are low and harsh catalysts are absent, so that the natural structure of the substances is not disturbed.



DIAMOND *Liquid* CHLORINE



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are remarkably free from impurities

Commercial chemicals can approach the purity of laboratory chemicals. When you choose Hooker Sulfides, that's what you expect and will get in every shipment.

Manufacturing refinements and closely controlled operations result in the production of sulfides that are practically iron free. In Hooker Sodium Sulfide you will find no more than 8 ppm Fe and in the Sodium Sulfhydrate no more than 5 ppm Fe.

To safeguard your operations from uneconomical side reactions due to impurities of reactants, use uniformly high purity sulfides from Hooker.

Technical data sheets and test samples may be obtained when requested on your company letterhead.

SODIUM SULFIDE Na_2S

Description: Light yellow colored solid in flake form. Rapidly soluble in water; slightly soluble in alcohol; insoluble in ether.

Physical Data:

Mol. Wt.	78.1
M. P.	100° C

Analysis

Na_2S	60 to 62%
NaCl	1.5% Max.
Other Na Salts	2.0% Max.
Fe	8 ppm Max.
Cu, Ni, Cr, Mn, Pb	1 ppm Max.
Water of crystallization	36.5 to 34.5%

Uses: In unhairing hides and wool pulling; desulfurizing viscose rayon; in manufacture of dyestuffs, chemical intermediates, paper pulp, special glass, soap and rubber; as an ingredient of dye liquor for textile dyeing; in calico printing, boiling out linen; ore flotation and metal refining.

Shipping Containers: Steel drums .... 90 and 350 lbs. net.

SODIUM SULFHYDRATE NaSH
(sodium hydrosulfide)

Description: Light lemon colored solid in flake form. Completely and rapidly soluble in water, alcohol and ether.

Physical Data:

Mol. Wt.	56.1
M. P.	55° C

Analysis

NaSH	70 to 72%
Na_2S	0.25 to 2.5%
NaCl	0.4 to 0.8%
Na_2SO_3 and $NaHCO_3$	0.04 to 0.4%
Fe	5 ppm Max.
Cu, Ni, Cr, Mn, Pb	1 ppm Max.
Water of crystallization	28 to 26%

Uses: In unhairing hides, in desulfurizing viscose rayon; in preparation of dyestuffs and other organic chemicals such as thioamides, thiourea, thioglycolic acid, thio- and dithiobenzoic acids, sodium thiosulfate.

Shipping Containers:
Lacquer-lined steel drums ...... 90 and 350 lbs. net.

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Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

For Your Information: Newsletter, April, 1948

Big news in the caustic-chlorine industry is that Dow Chemical Co. is switching to mercury cells for its new plant (50 tons/day of chlorine) at Sarnia, Ont. Two types of cells will be installed: the Krebs cell, and one developed from captured German equipment. Purification of the brine--previously a bothersome disadvantage of mercury cells--will be accomplished by recirculation of the anolyte to the well, resaturating it thereby with salt and precipitating the impurities right in the salt cavity. This marks the first use in North America both of the widely-heralded German cell design and the Krebs brine-purification process.

Latest development in the private oil companies' liquid fuels offensive is Esso Standard's conversion of its big "fluidized system" pilot plant at Baton Rouge to operate on oil shale. The plant, to be completed late in June, will retort shale supplied by the Bureau of Mines by the two-vessel method. A small, one-vessel unit is presently being operated at Bayway.

* * CI * *

A revolutionary new decalcomania ink that reduces drying time from six hours to three seconds has been developed for Meyercord Co. by Armour Research Foundation. Secret: drying by chemical action rather than solvent evaporation. Work is now under way to apply the principle to quick-drying printing inks. Ideal ink would be one that dries instantly by chemical reaction with a harmless gas.

Dow Chemical Co. will not go ahead with its projected commercial plant for carboxymethyl cellulose. Unpredictable building costs is the reason given. Pilot-plant production has also been discontinued.

* * CI * *

A group of chemical companies is sponsoring a research program at Battelle Memorial Institute on synthetic linings for black iron drums. Success in this venture will mean large savings for drum users, sizable new market for synthetic resins.

A new Surfax surface-active agent based on maleic anhydride will soon be announced by E. F. Houghton & Co. The material is an alkyl

aroyl sulfopropionate, made by condensation of an alkylated aromatic hydrocarbon with maleic anhydride followed by esterification and addition of sodium bisulfite. The molecular weight will be in the 400-450 range with the sulfonate group near the middle. Sales targets: rewetting and sanforizing assistant for textiles, leveling agent for dyes, absorbency promotor for paper.

* * CI * *

Watch for an announcement next month by Tennessee Eastman Corp. of first large-scale U.S. production of crotonic acid. Several manufacturers of varnish resins, plasticizers, and adhesives have developed crotonic-based products, are set to produce when Eastman's plant begins operation.

A new anti-freeze called PT (for "permanent type") is going on Texas Co. service station shelves. It is based on glycol from Jefferson Chemical Co., co-owned by Texas and American Cyanamid Co.

* * CI * *

Shell Chemical Corp. is operating a pilot plant and exploring market possibilities for normal paraffins in the 11-20 C-atom range, will announce their availability shortly. Cuts (over a three-carbon range) will consist of about 90 per cent normal paraffins, 6 per cent naphthenes, 3 per cent isoparaffins, and less than 1 per cent aromatics. Price will be higher than lower-purity materials now available--how much higher depending on size of markets uncovered. Potential availability is several million gallons per year. Most probable use: detergents.

A new device developed by the H. K. Ferguson Co. permits Vanstoning of stainless steel piping systems in the cold. Field fabrication of Vanstoned seamless stainless steel tubing is now safer and more convenient.

* * CI * *

Here and There:

Allied Chemical & Dye Corp. is working with fertilizer groups, attempting to develop fertilizer markets for waste liquors from ammonia pulping process ... A five-carbon sugar, xylose, is being made commercially from corn cobs by the J and J Chemical Co., Longmont, Colo. ... Battelle Memorial Institute reports "interesting results" in its work on lignin for plastics and as a plasticizer and emulsifying agent in rubber formulations ... Chas. Pfizer & Co. has multiplied itaconic acid output, materially increased production of citrate ester plasticizers ... The USDA has recommended Toxaphene for grasshopper control ... "Trend," a new household detergent being sold on the West Coast, is based on an alkyl aryl sulfonate ... The Florida Agricultural Experiment Station reports that pecan kernel oil has been recovered successfully in the laboratory; 77% is expelled at 200 degrees F. and 12 tons pressure.

The Editors

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Editorial CI

DON'T MAKE THE SAME MISTAKE TWICE!

by ROBERT L. TAYLOR, Editor

IN ANY FUTURE WAR in which this country may have the misfortune to become involved, chemistry and chemical engineering will necessarily play a part that will make the chemical accomplishments of World War II look modest by comparison. By the same token, the chemical industries will be called upon for production miracles of an ascending order. The popular theory that an atomic war would be over in a few weeks or even months is not widely credited by military men.

All of which means that chemical people have not only a very great and direct interest but also a responsibility in connection with the drafting of any new selective service legislation such as that called for by the President last month.

Few persons who served in managerial capacities in the process industries during the last war will forget the headaches, frustrations, and valuable time lost in fighting through deferments for technical men. And how, despite the best efforts of employers, many valuable young technical men were torn from their jobs in essential industry and placed in non-scientific jobs in the armed forces, jobs in which they were able to use little or none of their technical training.

A recurrence of legislation that would again permit the draining off of a large part of our technical manpower must be prevented, regardless of whether our future holds peace or war.

Armed Services Committees of both Congressional houses, under the chairmanships of Senator Chan Gurney and Representative Walter G. Andrews, have been conducting hearings this month in preparation for drawing up a new selective service act. Testifying before these committees, President Charles Allen Thomas of the American Chemical Society urged that the following provisions be incorporated into any bill that may be drafted:

1. Deferment of present scientists and technologists engaged in essential work in industry, government, and military establishments.

2. Deferment of university scientists engaged in teaching and research.

3. Deferment of a limited quota of promising scientific and engineering students.

These recommendations have been emphasized and amplified before both committees by other representatives of chemical industry and technical and professional societies. Let us hope that their testimony has registered.

A Source of Seasoned Talent

THIS MONTH CHEMICAL CONSULTANTS, through their representative body, the Association of Consulting Chemists and Chemical Engineers, laid before those persons administering and advising the various government research efforts an offer of their services.

The Association in effect said that it felt its members had more to offer the federal government in the way of scientific and research assistance than government had thus far seen fit to use.

The ranks of the private consultants and commercial laboratories contain some of our most distinguished contemporary chemical scientists. Many of them are world-renowned specialists in their fields. Yet they are broad-gauged in their thinking and bring to their jobs an accumulation of experience gained from working with many different groups on varied problems. Indeed, it is this combination of qualities that makes them successful consultants.

Our administrators of government research are being wasteful and unrealistic if they ignore or minimize this source of seasoned technical talent.


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Two basic processes, natural and synthetic, plus CSC's plant facilities and technical "know how," equal more than two hundred fine chemicals for home, factory, farm and hospital.
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COMMERCIAL SOLVENTS Corporation
17 East 42nd Street, New York 17, N. Y.

Chemical Industries

APRIL, 1948

What's new

BIG OXYGEN GETS BIGGER

Oxygen producers aren't even guessing how great the growing demand for their product will finally be. Low pressure equipment may make "cheap" oxygen available in chemical operations where cost has previously kept it out.

OXYGEN has been big business for years. However, present production should quadruple by the end of 1950. Recently the Elliott Co. has added its name to that growing list of organizations reaching for the still unknown but potentially huge oxygen market. How huge, cost will determine.

Capacity of the 2000 ton per day plant to be completed in 1949 for Carthage Hydrocol, Inc. will exceed the total present U. S. production. Another, to be completed in 1950 for the Stanolind Oil and Gas Co. will be even larger. Both of these plants, designed by Hydrocarbon Research, Inc.—the Stanolind plant to be built in conjunction with the Foster-Wheeler Corp.—will be utilized in an American version of the Fischer-Tropsch process for producing synthetic liquid fuel—and more synthetic fuel is to come, first from natural gas and then from coal.

What For?

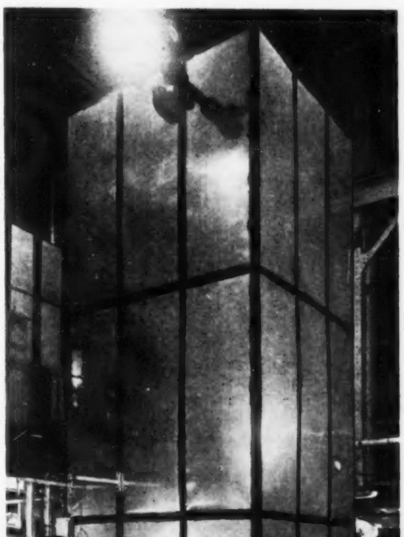
The potential uses of oxygen are legion. However, this potential is anchored to that old bug-a-boo of many processes, economics. Economics dictates that oxygen must be cheap for large scale use, as its major competitor is the raw material from which it is derived—air.

In addition to its use in producing synthetic liquid fuels (CI, July, 1946, p. 58), it is to be used in the production of acetaldehyde from ethane (CI Feb., 1948, p. 220). Another application is to increase the production rates of steel from open-hearth and electric furnaces. Three such applications are the 400 ton/day plant which Air Products, Inc. is building for the Weirton Steel Co. at Weirton, W. Va.; the 150 ton/day plant which the Koppers Co. is building for the Air Reduction Co. at Johnstown, Pa. to supply the Bethlehem Steel Co.; and the 135 ton/day plant which the Linde Air Products Co. is erecting for the Wheeling Steel Corp. Linde has carried on tests at 44 different mills.

Prewar, practically all oxygen produced in the United States had a purity of 99.5% or over and most was produced by two organizations, Air Reduction and Linde. Processes employing high pressures of several hundred pounds per square inch were used. The product mainly found its way into cylinders for use in oxy-acetylene welding.

What Happened?

The present ferment in the industry boiled out of World War II. Fliers who operated at great altitudes on long-distance bombing missions had to breathe. Consequently, equipment to supply them with sufficient oxygen at these multi-mile altitudes was necessary. Further, the production had to be at advanced bases. This need resulted in the wartime low-pressure units for fractionation of oxygen and nitrogen of the air, such as the M-7. It had been done for years, practically always with heavy high pressure equipment.



ELLIOTT PILOT PLANT: Its raw material is all outdoors.

This type of equipment had been used primarily because it was the most economical producer of the extremely high purity oxygen (99.5%) used for welding, the major prewar use. However, many industrial processes, as well as aviators, do not need such high purity. These less exacting specifications permit the more economical use of low-pressure equipment.

A low pressure plant, using the Frankl modification of the Linde cycle, with a maximum pressure of less than 200 psi, had been well developed in Germany before the War. This process, in addition to modification of the thermodynamic cycle, removed the water, carbon dioxide and other rather non-volatile contaminants by freezing them out rather than by the chemical means previously employed. However, the "frost" built up on the surface of the coolers to the point that the cooler quickly plugged. This necessitated an occasional switching of the flow from the inlet air to the dry effluent gas at periodic intervals to allow removal of the "snow" by evaporation into the off gas.

Regenerators packed with crumpled aluminum sheet were used in Germany. But the so-called reversing exchangers seem to be standard equipment for most American low-pressure processes. These express themselves in various modifications. Elliott has its own design. Hydrocarbon Research has two designs and A. D. Little sponsors the Collins exchanger although it is understood that a new design has reached the developmental stage. Kellogg has still another.

Elaborate heat exchange systems in addition to the fractionating tower and

an expander bring to a close the list of the major components in the system.

Who's Doing It?

In addition to Elliott, there are five other organizations who will build an oxygen plant at the drop of the proper number of dollars, either in the form of a firm contract for the oxygen production or for direct purchase of the plant. At present Air Reduction, Linde, and Air Products prefer to build and operate the plant with their own capital. The others, Hydrocarbon Research, Elliott, Kellogg, and A. D. Little will furnish a "turn-key" plant for the customer, or a design.

How?

Two, Elliott and A. D. Little, utilize a single distillation column operating at atmosphere pressure to perform the separation. Heat is supplied to the base of the Elliott column by a recompression system (CI, Aug., 1947, p. 213), using Elliott's Lysholm compressors (CI, Sept., 1945, pp. 464, 482).

All others, except Linde, plan to utilize a dual column system; i.e., a single relatively high pressure column operating at something on the order of 100 psi. If the conditions demand, Little will also design a unit of this type.

The condenser for the first and smaller column serves as the boiler for the larger low-pressure column, operating at just above atmospheric pressure. The low-pressure unit is usually mounted directly on top of the high-pressure unit.

The sudden postwar emergence of so many concerns in the "oxygen business" is the result of the wartime contact of many concerns with the NDRC research program and a realization that the cost of 90-95% oxygen was sufficiently low that the efficiency gains in many plants appear to counter the oxygen cost. Opinion on this subject is not unanimous. This is indicated by the fact that a Kellogg representative has remarked that, as yet, his company is not entirely certain that oxygen will be widely employed in the production of synthesis gas for synthetic fuel. The steam-hydrocarbon reaction used for natural gas-based synthetic ammonia is still in the running. For steel, a Linde spokesman asks whether compressed air may not be the answer to the desired increase in open-hearth efficiency.

"Cheap" oxygen may well remake the face of the chemical industry (its use is conceivable in any oxidation reaction, production of phthalic and maleic anhydrides, sulfuric and nitric acids, ethylene oxide, etc.). But the largest volume by far will be used for improving the efficiency of steel production and for production of synthetic fuels.

CHEMICAL STRATEGY

A chemicals division has been set up under the National Security Resources Board to advise the President on preparedness.

WHEN ANOTHER international storm starts pelting—if it does—Congress doesn't want us to be caught without an umbrella as we were in December, 1941.

Last Fall it legislated (and in December Truman set up) a National Security Resources Board to report directly to the President on matters of security as they relate to our material resources.

Chemicals Group Forming

Now in the throes of organization is a Chemicals, Rubber and Plastics Division—one of the 20-odd industry divisions which will eventually be organized under the Board. Heading up the division is Arthur Wolfe, whose first wartime job was with the Navy Bureau of Ships, where he handled chemicals, plastics, and rubber requirements. He served successively during the war years as aide and technical advisor to the Navy's Rubber Director, with the Inter-Agency Policy Committee on Rubber, with the Munitions Board Rubber Committee, and its Chemical Committee. He has since helped to develop the Administration's rubber policy embodied in pending Congressional legislation.

ARTHUR WOLFE: Semper paratus.

The division will attack such problems as military and civilian requirements of chemical materials in a future emergency, what materials should be stockpiled, and what should be done—based on recent experience—along the lines of allocation, curtailment, and other restrictions on the economy.

At the moment Wolfe constitutes the whole division; but available to him is NSRB'S consultant on chemical problems, American Cyanamid Company's Chemical Director Norman A. Shepard. By this summer, however, the division will be enlarged to working size.

Not a Fly-By-Night

Several cabinet and sub-cabinet members sit on the NSRB, and the chairman is Arthur M. Hill, who is on leave of absence from his directorship

WHAT EMPLOYEES WANT

IF THE answers given by employees of Koppers Co., Inc. last month are typical, what chemical company employees want most from their employers is job stability.

After this, they're interested in the size of their paychecks and a chance to get ahead.

Interesting is that most employees either didn't care about safety or took it for granted. It ranked 11th in total mentions, 8th in "1st choice."

Following is how the 7,100 Koppers employees ranked the things that are important to them about their jobs:

	Total Mentions	1st Choice	2nd Choice
A steady job	4,422	2,577	991
Pay rate	3,758	517	1,384
Chance to get ahead	3,000	491	800
A square boss	2,828	348	793
Working at job you like	2,520	1,084	593
Credit for the job you do	2,116	158	398

at Greyhound bus lines. The various division heads report to Hill.

The board is constituted as a permanent set-up. Technology changes so rapidly that mobilization plans made yesterday are obsolete today. A material that is now critical, and should be stockpiled, may be replaced shortly by an abundant substitute. The new Board is thus charged with keeping a constant watch on our material necessities and capabilities. It might well borrow its motto from the Boy Scouts.

LION BUYS

Lion Oil Company pays $10.5 million for surplus El Dorado, Arkansas synthetic ammonia plant.

Anyone doubting that Lion Oil Company is in the chemical business to stay is now confronted with $10,500,000 worth of evidence to prove him wrong. That's the price paid early last month to the War Assets Administration for the Ozark Ordnance Works, El Dorado, Arkansas, one of the nation's largest producers of anhydrous ammonia, ammonium nitrate fertilizer, and nitrogen fertilizer solutions. Since the original cost to the government was more than $27 million, and the fair value was set at about $13 million, it appears to be a satisfactory cash deal for both parties.

A wholly-owned subsidiary, Lion Chemical Company (merged with its parent organization in March, 1947), had operated the plant for the government on a cost-plus-fixed-fee basis from May 13, 1943, to May 13, 1946. Since that date, Lion had conducted operations for its own account under a long-term lease.

In announcing the purchase, the company revealed a $20 million issue of 3¼% sinking fund debentures (privately placed with the Equitable Life Assurance Society of the United States) due January 1, 1968. The purpose is "to finance the purchase of the plant, call the present outstanding $5.6 million principal amount of 3¾% sinking fund debentures due 1959, and increase cash and working capital of the company."

Record-Smashing Beauty

One of nine wartime government-owned synthetic ammonia plants, and one of five utilizing natural gas reforming as a source of hydrogen, the El Dorado installation set national and perhaps world records for low-cost, high-quantity production of ammonia. Well designed, and wisely located with cheap natural gas as both raw material and fuel, ample water supply, good rail facilities, and fertilizer-consuming areas (instead of ammunition plants) as markets, the plant can be expected to continue at a high production rate.

A six-step process converts the raw materials—nitrogen in the atmosphere, natural gas, and steam—into ammonium nitrate. (1) Raw gas (suction gas) is manufactured by reacting methane with steam, introducing air, and producing additional hydrogen by reacting CO with steam. (2) The 3:1 hydrogen-nitrogen gas mixture is purified. (3) The purified gases are converted to ammonia at 500 C. and 350 atmospheres pressure with a promoted iron catalyst. (4) Ammonia vapors are recovered from the purge gases. (5) Oxidation of ammonia produces nitric acid. (6) The nitric acid is neutralized with ammonia to yield ammonium nitrate solution.

Bigger and Better

Since leasing the facilities, Lion has added a new nitric acid plant consisting of three 45-ton-per-day capacity ammonia oxidation units (completed January, 1948), and an ammonium nitrate prilling (pelleting) plant with a monthly capacity of 15,000 tons. With the original installation, the following production was achieved: from May 13, 1946, to December 31, 1946, 98,175 tons of anhydrous ammonia and 109,037 tons of ammonium nitrate; in 1947, 161,650 tons of anhydrous ammonia, 137,578 tons of ammonia fertilizer, and 43,816 tons of nitrogen fertilizer solutions. The new nitric acid unit is expected to permit annual production of approximately 108,000 tons of nitrogen fertilizer solutions.

What do the figures mean beside the fact that chemicals form a big slice of the bacon Lion brings home to headquarters in El Dorado? (Approximately 24% of Lion's gross income of some $54 million in 1947 was contributed by the chemical division.) In part, they reflect a changed picture in the post-war nitrogen industry. Lion Oil Company, not in the field prior to the war, now owns about 11 per cent of the United States private nitrogen rated capacity. Spencer Chemical Company and Commercial Solvents Corp., also prewar non-producers, Mathieson Alkali Works, a small prewar producer, and Lion represent about 34 per cent of the total. (However, Commercial Solvents had the experience of making synthetic ammonia for a few months in 1926 at its Peoria plant before deciding that methanol was a better bet.) The two largest prewar producers, Du Pont and Allied Chemical, have about 60 per cent of the capacity as contrasted with their previous 85 to 90 per cent.

The record of achievement of Lion Oil Company naturally suggests further progress. An official states that the company is able to supply only a fraction of the demand for its present products; and, that while it is aware of the possibilities of petroleum hydrocarbons, including plastics, there is now no commercial appropriation for expansion into such fields.

What Next?

Indications of the Lion trend of thought are contained in a recent annual report. It notes that the plant could be modified to produce a variety of materials, including methanol, dry ice, urea, formaldehyde, argon, plastics, dyes, paints, and insecticides. One of the most logical operating improvements would be to utilize the 300 tons per day of CO_2 that are being discharged into the atmosphere either for dry ice or in combination with ammonia for the production of urea.

SYNTHETIC AMMONIA PLANT: And it all belongs to Lion Oil Company now.

"COAL" RESIN

The cooperative efforts of a mining company and a chemical company have made an interesting resin available from Utah coal.

LEE, KLEPETKO AND BENNETT: Four ounces started the ball rolling.

THE RESINOUS content of Utah coal deposits has tantalized chemists and engineers for many years. A major reason is that the coal which can be economically mined from a 600-acre plot contains over 1,000,000,000 pounds of recoverable resin—and there are many such plots.

The Product

The resin content of the coal averages about 5-7% by weight and is an unsaturated hydrocarbon. It has three major virtues: a high solvent release value, low price, and an essentially unlimited supply. For most purposes it is primarily competitive with the indene-coumarone resins and rosin.

The process for its production was a joint development of the Combined Metals Reduction Co. and the Interchemical Corp. Sales are being handled by the R-B-H Dispersions Division of Interchemical and the Pan-American Resin and Chemical Co.

"Coal" resin melts at 160-170°C. and is extremely resistant to attack by alkalies, water and alcohol. It is completely miscible with both aliphatic and aromatic hydrocarbons, allowing the use of many different solvents with the resin in varnish and ink formulation. It is compatible with vegetable and mineral oils, natural and synthetic rubber, ester gum, phenolic and alkyd resins, and with such natural resins as kauri and copal.

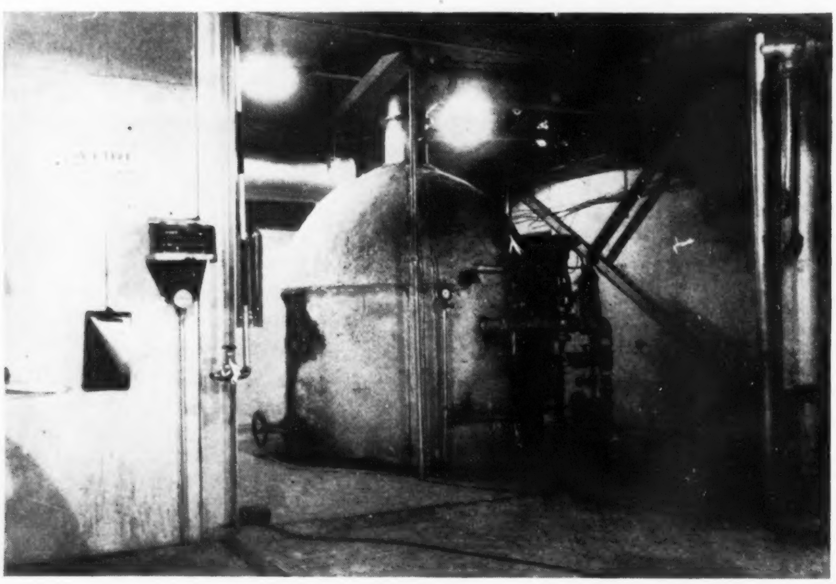
Combined Metals' new plant at Bauer, Utah, is the only large producing unit now in operation and is reported to be capable of producing 10-15 tons per day of refined coal-free resin. Another production unit, that of the Nagelvoort Co., at Huntington, Utah, is reported to be ready to begin operations in the near fuure. Nagelvoort uses a sink-and-float procedure rather than the flotation process of Combined Metals.

Production of "coal" resin has interested Combined Metals, a former subsidiary of the National Lead Co., for some twenty-odd years. The patent on which the present method of separating coal and resin is based was issued to W. D. Green in 1929. However, it was not until a story-book series of events brought Interchemical Corp. into the picture that "coal" resin was launched as a commercial product.

Four Ounces Excites Interest

In 1942 Irving Bennett of Syntomatic Corp. was in Utah trying to develop new sources of sage, pine, and cedar oils. While there he picked up a four-ounce sample of "coal" resin. Upon his return to New York he showed it to Ernest Lee, resin chemist for Interchemical. The sample excited Lee's interest and the following summer Bennett had two jobs: continuation of his search for new sources of natural oils and location of an organization which was in a position to enter into the commercial production of "coal" resin for Interchemical's use. Combined Metals joined up.

Although the Green patent covered the basic features of the process for the separation of resin from coal via flotation, the usual number of quirks and kinks had to be ironed out before it could be placed on a commercial basis. The solution of these difficulties came about primarily through the cooperative efforts of Ernest Klepetko, metallurgical manager of Combined Metals, and Ernest Lee, of Interchemical.



COMBINED METALS PLANT: 250 tons of coal, 15 tons of resin.

An essential requirement of the process is that the resin be recovered from coal without excessive size deterioration of the coal being processed. Economic operation of the process dictates sale of the residual coal at no decrease in price. This has been accomplished—in fact, the coal issuing from the plant has been improved. Its BTU value has been increased. In addition to the removal of the 5-7% of resin with a BTU value of only about 8,000, the normal 13,000 BTU heat content of Utah coal has been further enhanced by the removal of an appreciable amount of coal slate during the processing.

It is not necessary to grind the coal to finer than about 6-mesh to effect essentially complete recovery of the resin. The extreme friability of the coal caused much difficulty; for example, mechanical agitation in the flo-

tation cell was ruled out because of the excessive attrition that it produced. An air lift cell was the solution.

Refining

The development of a satisfactory flotation process was not the least of the many headaches. Possibly the most difficult problem of all was the recovery of the pure resin from the concentrates by the removal of the fine particles of coal. After many tests it was determined that petroleum ether (hexane) was the best solvent for separation of the resin from the coal and mineral matter. Pressure filtration proved to be the answer for separating the coal particles from the solution.

Resin recovery from the resultant clear solution is theoretically quite simple—merely evaporation of the volatile solvent. However, the very high viscosity of the solution after the removal of about 65% of the solvent made that impractical. Eventually the method used in the present plant was developed: i.e., flashing off the hexane content of the 65% resin solution from the evaporators by continually adding the solution to a mass of the molten resin. An equivalent quantity of product is continually drawn off and cast into drums for shipment.

PETROLEUM CHEMICALS FROM NECHES

Jefferson Chemical Co., Inc, has launched its career with tankcar shipments of three ethylene derivatives from its new Neches plant.

CORPORATE progeny of mixed chemical and petroleum industry parentage are not new, but they are still novel enough to evoke more than passing interest from the members of both families. One of the newest—Jefferson Chemical Co., Inc., petroleum-chemical offspring of American Cyanamid Co. and The Texas Co.—this month reached full fledged adulthood. It has completed its plant at Port Neches, Texas (at a reported cost of $12,000,000); is shipping out tankcars of ethylene oxide, ethylene glycol, and ethylene dichloride; and is sold up to capacity for the present.

Aside from the three products mentioned, Jefferson is also currently producing diethylene glycol, aromatic distillate, and hydrocarbon polymer, which are obtained as co-products.

For the Future

But for the future, the company hints at more ambitious plans. A sizeable long-term research program on other petroleum hydrocarbon derivatives has been under way for almost two years, and the present new production facilities, which occupy only about 100 acres of an 1100-acre property, have been laid out with a definite eye toward expansion.

What additional products actually are under consideration, however, company officials decline to say. Their only comment is that, like the present products, they probably will be organic chemicals that can be shipped in tankcar quantities. Benzothiophene (thianaphthene) and some other thiophene derivatives have been mentioned as possibilities (CI Newsletter, September, 1947).

Basic Position

Jefferson looks upon itself as a normal outgrowth of the recent trend toward increased utilization of petroleum raw materials for chemical manufacture. But aside from long-term advantages it may hold for both its parents in this respect, the company had somewhat more compelling and immediate reasons for being born.

American Cyanamid was building up a substantial business in acrylonitrile, important intermediate for such products as Buna-N synthetic rubber and other acrylonitrile polymers. A principal raw material for acrylonitrile is ethylene oxide, but ethylene oxide is also in urgent demand for the growing synthetic detergent and ethylene glycol anti-freeze markets. It was apparent, therefore, that if the demand for the oxide continued in the direction it was headed, a more basic producing position would be highly advantageous for Cyanamid. (Cyanamid has already acquired about 900 acres of land adjoining the Jefferson installation.)

At the same time the Texas Co., as a major petroleum producer, stood to gain if it could channel its refinery gases into ethylene glycol, which it could then sell as anti-freeze through its service stations.

50-50 Ownership

So Jefferson was formed in November, 1944, with all of these objectives in mind. Ownership is divided evenly between Cyanamid and Texas, as is the membership of its twelve-man board of directors. Cyanamid men on the board are W. B. Bell, chairman, P. M. Dinkins (formerly Cyanamid), R. C. Gaugler, L. C. Perkinson, R. C. Swain, and M. C. Whitaker. The Texas men are W. S. S. Rodgers, vice chairman, R. J. Dearborn, M. Halpern, H. T. Klein, W. E. Kuhn, and W. M. Stratford.

Top officers of the company have likewise been drawn from the ranks of the two parents. Philip M. Dinkins, president, is a former vice president of American Cyanamid and Chemical Corp., while the two vice presidents, R. J. Dearborn and M. Halpern, are both Texas men. Treasurer L. C. Perkinson and Secretary W. P. Sturtevant double in their respective capacities for both Cyanamid and Jefferson.

Cracker Gas to Glycol

The Jefferson plant, which shipped its first carload of product in February, is located on the Neches River in Jefferson County, Texas, immediately adjoining the property of the Port Neches asphalt works of The Texas Co. Its refinery gas raw material, however, is piped from the Port Arthur refinery of The Texas Co. about five miles away. This gas consists of both saturated and unsaturated hydrocarbons up to and including C_3's.

P. M. DINKINS: An eye to the future.

At the Jefferson plant the incoming gas is put through a Lummus ethylene unit, where it is first treated with diethanolamine to remove carbon dioxide and hydrogen sulfide. This feed stock is then combined with the effluent from the cracking heaters, compressed, and separated in fractionating towers, some of which are operated under low temperatures requiring refrigeration for cooling and condensing. Propane and ethane are used as refrigerants. The unit produces a purified ethylene stream, an aromatic dis-

tillate (high in aromatics), and a hydrocarbon polymer stream.

The purified ethylene is piped to the ethylene oxide and ethylene glycol unit, which was constructed by E. B. Badger & Sons Co. and employs the chlorhydrination process. In this process ethylene is chlorhydrinated to ethylene chlorhydrin, which is heated with lime to give ethylene oxide. The oxide is either shipped as such or hydrated to ethylene glycol.

The crude ethylene dichloride produced in the operation is purified in a separate unit by drying and distillation, a mixture of higher chlorinated hydrocarbons being obtained along with the purified ethylene dichloride.

250,000 Lbs. per Day

No official data on the production capacity of the plant have been released. According to one published source,* however, the ethylene unit will make about 175,000 lbs. of ethylene per day. Assuming that the chlorhydrination step yields the usual ratio of chlorhydrin to dichloride, this amount of ethylene should produce roughly 60,000 lbs. of ethylene dichloride and 230,000 lbs. of ethylene oxide equivalent per working day.

The present plant is completely self-contained except for electric power, which is purchased. Steam is generated in gas-fired boilers, and water is supplied by an 18,000,000-gal. private fresh-water reservoir on the premises.

Chlorine for chlorhydrination is shipped by tankcar from the Southern Alkali Corp. plant at Lake Charles, La. Eventually, it is expected that this and other raw materials will be brought in by barge, since the Neches River provides access to ocean-going vessels.

*"Chemicals from Petroleum," by E. R. Smoley, R. M. Torrey and L. Kniel, *Petroleum Refiner*, November, 1947.

Research in New York

The company has temporarily located its research facilities in New York City and at the Port Arthur refinery of The Texas Co., where it also has a good-sized pilot-plant area. It is now in the process of determining the location for a new permanent research headquarters.

Jefferson has no illusions about the road it will have to hoe in the increasingly competitive petroleum chemicals field, but the plans it is making are long range. Assisting the officers in formulating and carrying them out are Dr. Max Neuhaus, manager of the technical and research department; L. P. Scoville, chief engineer; W. H. Bowman, manager of the sales department; and A. A. Triska, plant manager.

NOTHING BUT LITHIUM

Lithium Corporation of America, Inc., makes lithium chemistry its sole business—and business is growing.

RECENT completion of a new unit for tonnage production of lithium amide is the latest forward step in Lithium Corporation's progress (CI Newsletter, January, 1948). Lithium and lithium compounds alone are the "secret weapons" with which the company is establishing its beachheads in American industry.

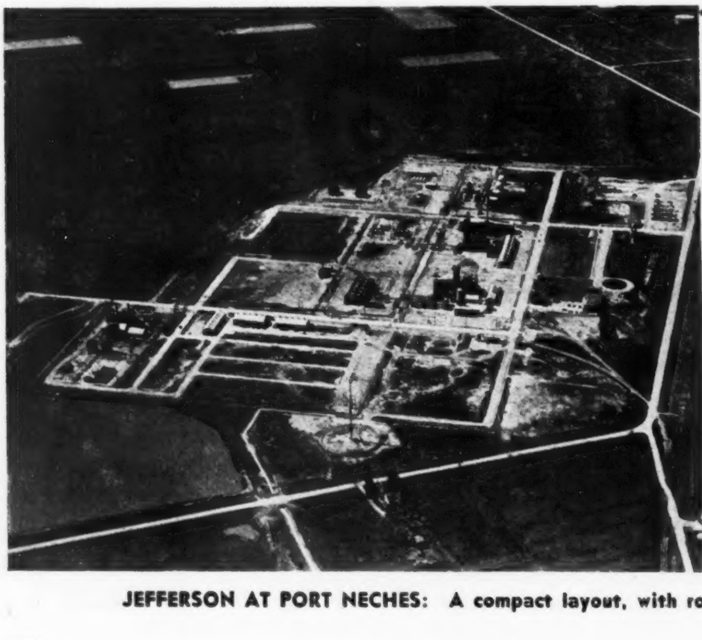
Lithium amide is the latest of the lithium compounds to find large-scale commercial use. It is an efficient agent for certain types of organic reactions, producing high yields; but its most important asset, in contrast with its competitors, is stability. The first amide unit was constructed in 1947, but as a result of increasing demand this unit has now been superseded by new and larger equipment. Much of the material is reportedly used in the synthesis of anti-histamine drugs.

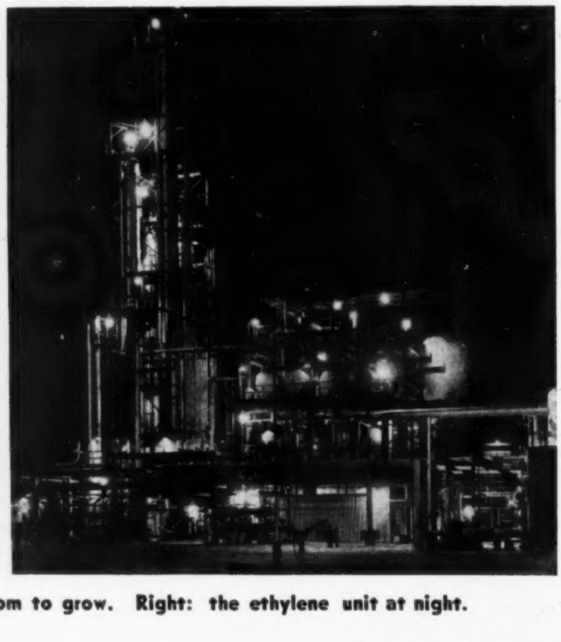
Rip Van Winkle for 130 Years

While lithium was discovered in 1807, the element and its compounds remained commercially unimportant until the United States entered World War II. Previously, lithium compounds, high in price and produced on a very modest scale, enjoyed a limited use in a very few industries.

But with the war came unparalleled demands for lithium hydride as a hydrogen carrier for the famous "Gibson Girl" radio transmitter. For best results the "Gibson Girl" required a hydrogen-filled balloon to carry aloft a 200-foot antenna. Because of its weight, the standard compressed gas cylinder was out of the question; a light weight substitute had to be found. The solution lay in a light metal canister filled with lithium hydride. When this canister was dipped in water, chemical action released 60 cubic feet of hydrogen gas.

But there were no facilities for production of the needed quantities of lithium hydride. One hundred pounds of lithium hydride requires 88 pounds of lithium metal, which calls for 528 pounds of lithium chloride, which in turn requires 465 pounds of lithium carbonate. While there are various





JEFFERSON AT PORT NECHES: A compact layout, with room to grow. Right: the ethylene unit at night.

types of lithium-bearing ores, the one which occurs in the largest and most accessible deposits is spodumene. This ore contains only 4½ to 6 per cent lithium oxide even after concentration at the mine. In order to produce 465 pounds of lithium carbonate, it is necessary to mine and concentrate 3,348 pounds of spodumene.

It is clear from these facts that demands for large quantities of lithium hydride required extensive production facilities. These facilities were provided by Lithaloys Corporation in Long Island City, N.Y. To supply this customer's plant with the tonnage of lithium chloride it required, it became apparent that a new chemical

KARL M. LEUTE: Manganese, mines, and Metalloy.

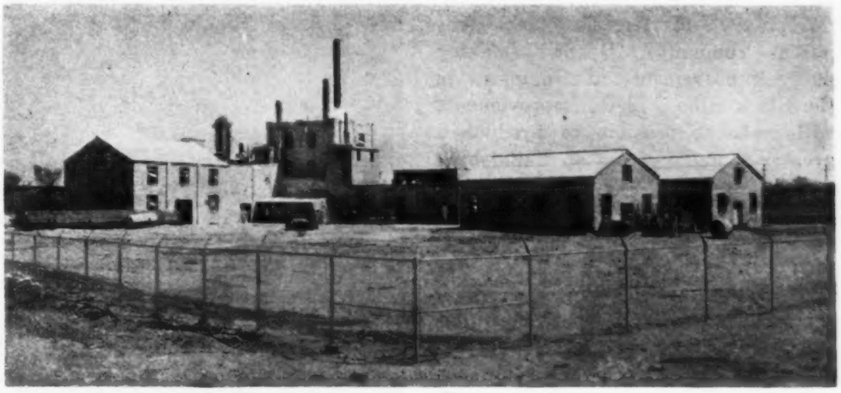
plant to produce the chloride, as well as new mining operations to supply the spodumene, had to be developed.

Lithium from Leute

At this point, Karl M. Leute and the newly-formed Metalloy Corporation entered the picture. He had had an interesting background in chemical and metallurgical fields, having developed, as founder of Electro-Manganese Corporation, the first commercial production of electrolytic manganese. The firm had built a plant in 1938 at Knoxville, Tenn., which has since been expanded several times.

Leute organized Metalloy Corporation in 1941 to manufacture lithium chloride. Subsequently Lor Corporation was formed to mine and develop spodumene ore bodies which Leute owned in the Black Hills of South Dakota. He was president of both corporations.

With the aid of government financing, Metalloy Corp. built a chemical processing plant at Minneapolis and undertook an extensive program of research and development.



METALLOY PLANT: From Black Hills ore, a pharmaceutical reagent.

In 1947 the name of Lor Corporation was changed to Lithium Corporation of America, Inc., and 100% common stock interest in Metalloy Corp. was acquired. Lithium Corporation is now the only firm solely devoted to the production of lithium and its compounds.

Construction began on the new chemical plant in Minneapolis in 1942 and operations began in December of that year. Mining operations by Lor Corp. kept pace with the demands of the Minneapolis plant.

War's End Cuts Market

With the end of World War II, the large-scale demand for lithium hydride ceased abruptly. Metalloy then turned its attention to the development of new lithium compounds and expansion of industrial uses for the older compounds. Previously lithium had found few applications that were commercially important. The carbonate had been used to a limited extent in special glasses; the hydroxide was an important part of the electrolyte in iron-nickel storage batteries; the fluoride found use in aluminum welding rods; and the chloride had been employed as a dehumidifier in certain types of air conditioning systems.

New lithium compounds developed by Metalloy have been especially useful in the ceramics industry, but are now finding new uses every day in other fields. They include lithium aluminate, lithium borate, lithium cobaltite, lithium manganite, lithium molybdate, lithium silicate, lithium titanate, lithium zirconate and lithium zirconium silicate. Porcelain enamels have been improved in actual plant practice through use of one or another of these new products.

Since the enameling industry has adopted lithium compounds, demand for them has lifted production from comparatively small-scale operations to a large-scale tonnage basis. Metalloy's management is convinced that the cycle of large production and lower costs will bring prices more in line with other alkali salts.

Metal Uses Grow

Within the past year, there has been a growing interest in lithium metal. The metal has a twofold interest: in non-ferrous metallurgy as a deoxidizer and in organic chemistry for Grignard-type reagents.

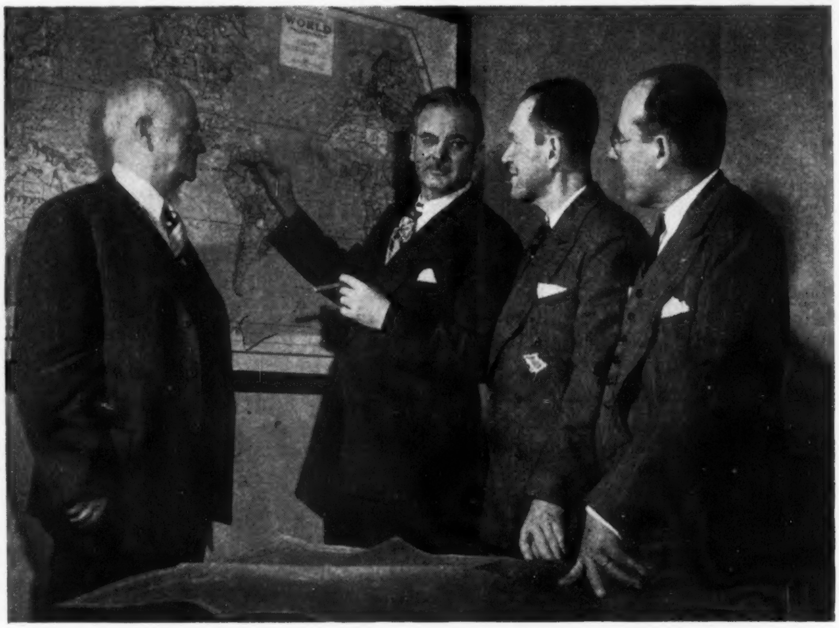
A number of years ago it had been discovered that lithium metal, added to molten copper-base alloys, proved an extremely strong and effective deoxidizer and grain refiner. Yet a practical method of application in actual foundry practice proved a stumbling block because lithium metal, like sodium, had to be transported and stored under kerosene or similar liquids. Recently Metalloy solved that problem by extruding the metal into slugs of definite weight, then sealing the slugs in copper tubing. Now lithium can be added to the crucible or ladle without danger. Similar "cartridges" of aluminum have since been introduced.

Perhaps the most promising application for lithium lies in the field of organic chemistry. Lithium metal has been found to have distinctive value in Grignard-type reactions. Since organo-metallic compounds and the Grignard reaction are becoming increasingly important in certain classes of organic synthesis, it is a significant fact that lithium makes possible some reactions not obtainable with magnesium. In still other reactions lithium produces higher yields and greater speed of reaction. Synthetic vitamin A has recently been produced in Holland through a modified Grignard-type reaction employing monomethyl lithium.

Acting on the conviction that lithium and its compounds will be used on a constantly increasing scale, Lithium

Corporation of America, Inc. (the parent company), is now making many improvements at its mines in the Black Hills. These improvements will make it possible to produce a greater tonnage of ore at diminishing costs. Metalloy, as the chemical manufacturing and research unit, is erecting new and improved manufacturing facilities at Minneapolis to take care of both the increased consumption now in sight and the anticipated long-range demand.

The ultimate purpose of all of these new mining and manufacturing facilities is to make lithium available at relatively low cost. In the past the use—and even research into the uses —of lithium have been delayed by the twin obstacles of small production and high cost. Metalloy officials believe that with substantially lower costs in prospect, interest in the metal and its compounds will be stimulated.



THE PLANNERS*: With $9 million they create an alkali industry.

HIGH ALKALI

Colombia will spend $9 million on alkali industry at Bogota.

IF THE INDUSTRY starts to talk about high alkali down Colombia way, come 1952, they'll be thinking in terms of kilometers of altitude—not pesos. The $9 million project that is being built by the H. K. Ferguson Company, industrial builders of New York, Cleveland, and Houston, under the aegis of the Instituto de Fomento Industrial, Colombian governmental agency in charge of the nation's industrialization program, will have as one of its objectives cheaper alkali.

Production of this material in the Bogotá area, where much of the country's population is concentrated, will be cheaper than importing it from the United States. The expensive haul up the mountains from the coast will be eliminated, and the interior will be assured of a constant supply.

Seven Years A-Growing

The plan initially undertaken in 1942 was to establish only a small soda ash plant, but the present target calls for daily production capacities of 100 tons of soda ash, 50 tons of dense ash, 25 tons of chemical caustic, 6 tons of electrolytic caustic, 200 tons of refined salt and 12 tons of bicarbonate of soda. In addition, there will be a coke plant with ammonia as a by-product. The design of the entire installation is such that capacity can be doubled economically when demand requires.

Well situated in regard to the peculiar requirements of the country, the plant will use brine pumped 8 kilometers from the Zipaquira salt mines.

* (l. to r.) A. L. Campbell, in charge of design for the Ferguson Co.; Reginald C. Smith, Ferguson export manager; Dr. Juan de Dios Ceballos, Director of the Instituto de Fomento Industrial; and Dr. Carlos Gomez, Director of Salt Properties for the Bank of Colombia.

STARTING SALARIES FOR ENGINEERS

NEW YORK University's College of Engineering graduated 107 men from its Day Division last June. Queried last Fall on the conditions of their first jobs, the graduates reported their starting salaries, the averages of which have now been compiled:

Type of Engineering	*Average Salary per Month*
Electrical	$257
Chemical	250
Mechanical	247
Civil	237
Aeronautical	218
Administrative	206

The graduates were distributed among the various classifications as follows: 6 administrative, 26 aeronautical, 9 chemical, 15 civil, 14 electrical, and 37 mechanical. The survey also brought out the facts that 79 per cent of the graduates are in technical positions in industry or civil service, 15 per cent in teaching or graduate study, 4 per cent in nontechnical positions, and 2 per cent unemployed. Three-fifths of them found their employment in the New York metropolitan area.

The electricals and chemicals are apparently doing best from a monetary point of view, but one electrical engineer is doing even better: he is selling candy wholesale at a salary of $400 per month!

A similar study at Illinois Institute of Technology on its last semester's graduating class showed that the average starting salary was $260-$275 per month, while the June class averaged $250—about the same as N. Y. U.'s. The February 1947 class at I. I. T. received an average of $231 per month on their first jobs.

Equaling N. Y. U's candy salesman was one I. I. T. mechanical engineer who received $400. Two chemical engineers—also graduated last semester—obtained jobs at $350.

John J. Schommer, director of placement at I. I. T., reports that there's an acute shortage of civil engineers, but that chemical engineers are also much in demand. He has received an increasing number of requests for sales engineers.

Practically all recent graduates are working or pursuing graduate study. None are unemployed for lack of available positions.

What's new

Limestone will be hauled from nearby deposits.

Housing facilities for the 500 workers needed to staff the plant are under construction, and a laboratory and machine shop, as well as administration facilities, have been completed. The first chemical unit for the production of soda ash has been started.

The Whole Picture

This expansion of the alkali capacity of Colombia is only part of the program to develop a chemical industry to meet national requirements. While at present only minor quantities of soda ash, sulphuric acid and chlorine are manufactured, plans for large-scale production of sulphuric acid and —outside the chemical field—steel have been announced. Sulphuric acid from the Bogotá area sulphur deposits will be diverted mainly to fertilizer. Products from the rising alkali installation will supply the textile, water purification, soap, and glass industries in this section. Some of the production will also be used in the rubber, tanning, and oil refining industries.

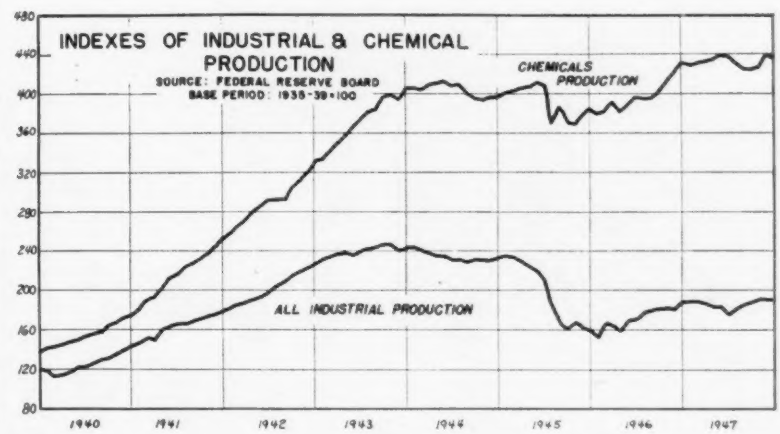
The advantages of American low-cost large-scale production and cheap water transportation will give imports of alkali at Barranquilla an edge in price over the Bogotá products. Here again the freight factor—the abnormally high cost of moving the materials down the mountains to the coast—makes the difference.

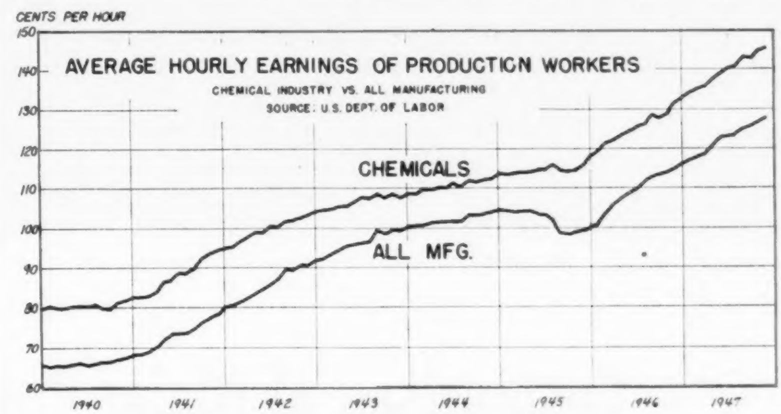
CHEMICAL INDEXES →

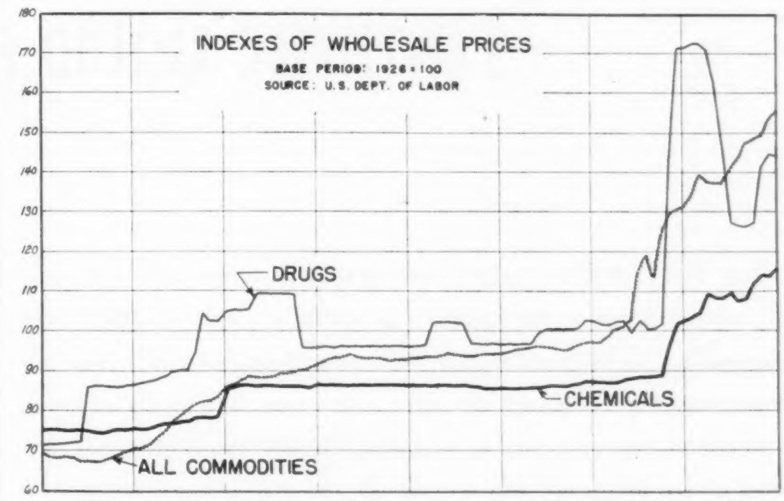
AS A SUPPLEMENT to its Chemical Facts and Figures, last published in February, 1946, the Manufacturing Chemists Association last month issued "Statistical Report No. 26—Wage, Hour, Employment, Production and Price Trends in the Chemical Industry."

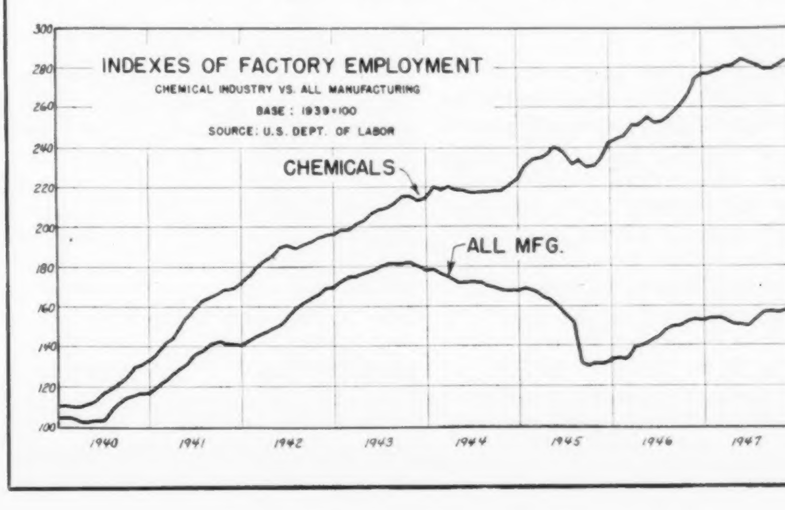
Four of the charts reproduced here tell their own story. Other significant data contained in the report: average weekly earnings in the chemical industry are up 100% from the 1935-39 base period, as against 64% for the U. S. Dept. of Labor's cost of living index; average weekly earnings in the chemical industry were $60.08 in December, 1947, against $53 for all manufacturing industries; factory payrolls for the chemical industry are up 460% from 1939, against 260% for all manufacturing industries.

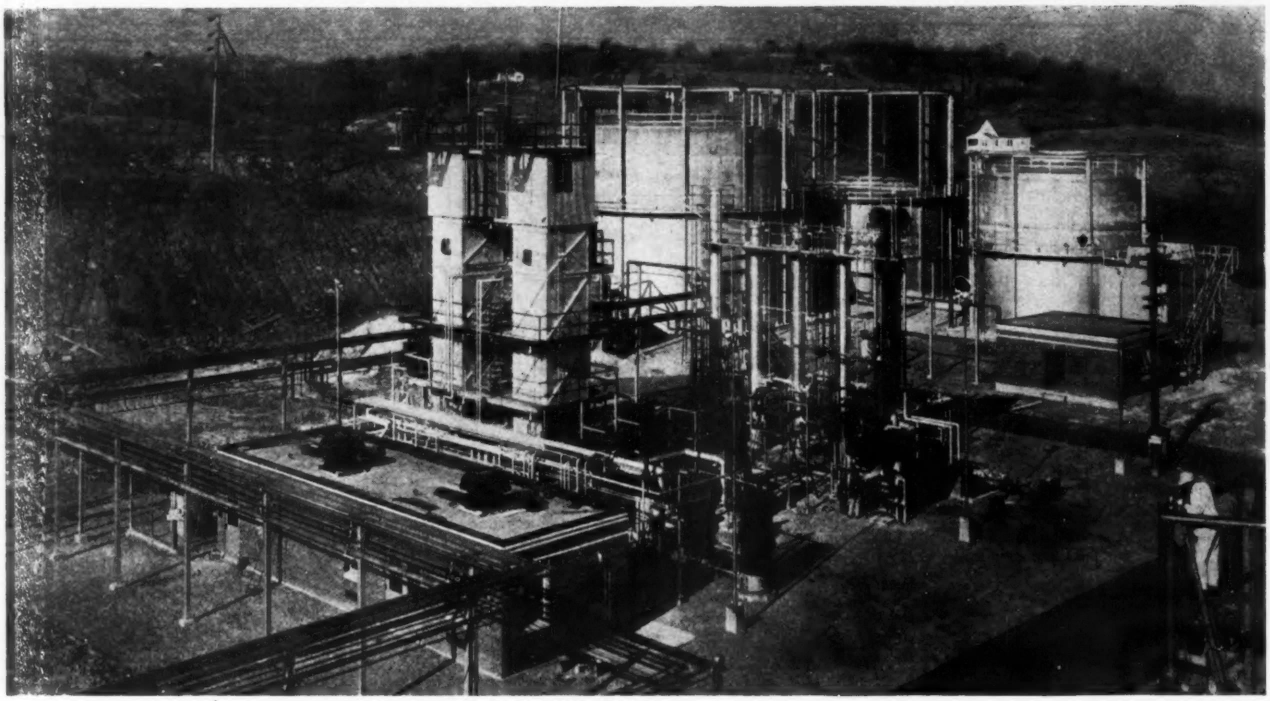
The chemical industry, its employees and its customers seem to be faring better than those of industry as a whole thus far in the postwar era. With general business the best it has ever been, that is saying a good deal.











Hydrogen and synthesis-gas production from natural gas, Bureau of Mines Pilot Plants, Bruceton, Pa.

Comparison of Major Processes for SYNTHETIC LIQUID FUELS

by W. C. SCHROEDER*

SHOULD THE UNITED STATES EMBARK on a large-scale synthetic fuels program, there is the question of which process: oil-shale, coal hydrogenation, or Fischer-Tropsch from natural gas or coal? Here an eminent authority compares the three with respect to types of products produced, present state of technological development, types and location of raw materials, and investment and production costs.

HOMES heatless and factories idle because of lack of oil during the recent cold wave have spotlighted a problem that has been of increasing concern to those responsible for supplying the nation's energy requirements. From a prewar nation producing 4 million barrels daily and possessing a reserve capacity to produce an additional million barrels of natural crude oil each day from a reserve of 20 to 21 billion barrels, we have become a producer of well over 5,000,000 barrels daily from essentially the same reserve. Moreover, demand is expected to increase to 6 million barrels daily this year, and may reach 7 million by 1954. Since there is no reasonable assurance that continued exploration will add appreciably to our known reserve beyond that capable of supplying about 5 million barrels daily for a number of years, the immediate problem is to seek other sources to balance this potential deficit of 2 million barrels a day.

An obvious solution is foreign oil. American petroleum companies can probably import oil at a price below that at which synthetic oil can now be produced in this country if they do not have to pay excessively for concessions, taxes, and the oil itself. Bitter experiences in trying to provide safety for tankers on the sea lanes along the coast of our own country during the past war make dependence on that answer a poor military risk. "Big-Inch" and "Little-Big-Inch" pipe lines cannot funnel oil from the Middle East even if the fields are in friendly hands and undamaged. Nor is our economic security any more assured with highly industrialized countries of Europe turning from coal to oil to solve their energy problems, and backward areas of the world seeking it to run the mechanized economies they must have. For these reasons, there is more or less general agreement that this country should intensify its investigations of new domestic sources of oil.

More oil unquestionably will be discovered, but the prospects for materially increasing reserves in the United States are not bright. Maintenance

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of the 21 billion barrel reserve has been possible only through extensions and revisions of previous estimates on known fields.

Coal, which comprises more than 90 per cent of our mineral fuel energy reserves (exclusive of fissionable materials), looms large in any plan. Although all this coal cannot be mined easily, it is evident that there is sufficient to meet our needs for many hundreds of years. There is the immediate consideration of colloidal fuels in which powdered coal is used as an extender for the oil. However, it is generally felt that if industry shifts to coal to that extent, it will go all the way. The conversion of coal to gas in a favorable location and shipment by pipe line to the point of use has interesting possibilities. Such careful exploitation of our energy potential may relieve some of the pressure on the dwindling oil supply, but it will not solve the problem alone. The major role for coal is as a raw material in the synthetic production of liquid hydrocarbons.

While the government and the petroleum industry agree that national security demands continuation of the government program of research begun under the Synthetic Liquid Fuels Act of 1944, testimony before the House Interstate and Foreign Commerce Committee reveals that there is some disagreement as to what processes should receive the greatest attention at this time, what raw materials are to be exploited, and who shall conduct the different enterprises.

The Department of the Interior advocates construction of at least one commercial-size plant for each of the three synthetic processes that hold promise of meeting the requirements of our economy. These are shale oil retorting, the Fischer-Tropsch process using coal, and coal hydrogenation.

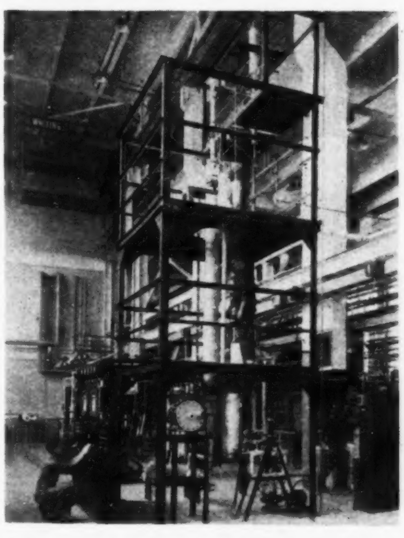
It is not the object of this paper to attempt a decision on any controversial question as to how the interests of the nation may best be served, but to examine and compare each of these processes with regard to the types of fuels it will yield, the state of development of its technology, amounts and location of raw materials required, and the indicated capital and operating costs.

OIL SHALE

Oil shale is a rock containing a solid carbonaceous material called kerogen. Heating breaks down the large molecules of this solid material into small molecules which are liquid or gaseous. Shale oil production consists of mining the shale, crushing it, and passing it through a retort where it is heated to crack the kerogen and yield crude shale oil. This crude oil must be refined to make useful products.

Present indications are that the product is suitable for industrial fuel oil and Diesel oil (cetane rating of 35-45). The low-octane (50 to 60) gasoline obtained makes poor motor fuel stock. Special refining problems are presented because of considerable amounts of unsaturated material and combined sulfur and nitrogen. Light hydrogenation at 700° F. and 200 to 300 psi pressure has given good results in producing lighter Diesel oil, but disappointing results on motor fuel because the octane number was reduced materially.

The only large plant in the United States is the Bureau of Mines demonstration plant at Rifle, Colorado, where investigation into all phases of shale oil production is being conducted on an extensive scale. One of the two mines there permits the mining of shale of any richness between 5 and 80 gallons of oil per ton as needed in the retorting work. This allows testing the performance of the retorts on each grade of shale. The second mine, essentially an underground quarry with a capacity of 1500 tons a day, enables accurate determination of production per man day and mining costs. It is anticipated that the present production of 25 tons per man day, which has been achieved since operations were begun last October, will be increased to 40 to 50 tons per man day during 1948. Such production (ten times the production of the average coal mine) is made possible by the use of large-scale mechanized methods well suited to the western shale deposits. Rooms 60 feet by 100 feet can be opened without danger to permit large electric or Diesel shovels to operate. Under these conditions, the shale will be mined for about 50 to 60 cents per ton.



Bureau of Mines gas synthesis process internally-cooled pilot plant, Bruceton, Pa.

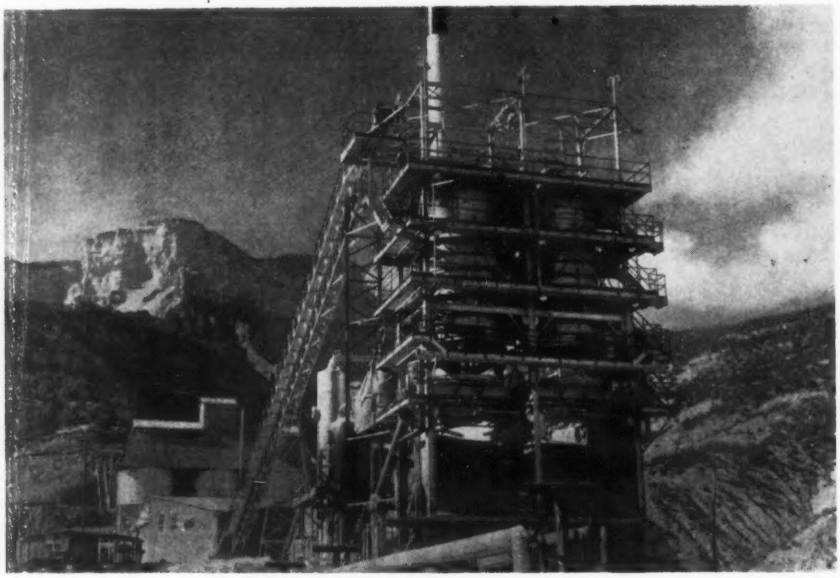
The crushers and screens were designed to furnish shale crushed and sized for the range of particles required for the N-T-U retorts. Tests also determine such information as percentage of fines, distribution of various particle sizes, throughput capacity and power requirements.

Operating experience with the N-T-U retort has progressed in accordance with a predetermined schedule of runs to give much data that will be invaluable in the designing of a high-capacity continuous type of unit which will be the ultimate commercial retort. Monthly throughput in excess of 1,000 tons has been maintained. Yields have now reached 85-90 per cent of assay. Once the optimum conditions for the distillation of oil shale by this principle of internal combustion have been determined, the development of a continuous oil-shale retort can proceed more rapidly.

In pilot plant work, the Bureau of Mines is experimenting with Jodavis, a flash carbonizer, and the Gas-Flow retort, which is continuous and employs the transverse flow of hot gas through a relatively narrow bed of crushed shale to effect retorting. A continuous retort owned by the Union Oil Company of California is an internally-fired downdraft type. A relatively large pilot plant of the Standard Oil Development Company at Baton Rouge, Louisiana, is being modified to retort shale. It will utilize the fluidized catalyst technique consisting of two fluidized beds, one for retorting the shale and the other for burning the fixed carbon in the retorted shale. The Bureau of Mines is cooperating with both of the companies in testing these retorts.

Refining studies are being conducted at present by the Bureau of Mines Petroleum and Oil-Shale Experiment Station, Laramie, Wyoming, and by several cooperating oil companies. Completion of the demonstration plant refinery at Rifle, Colorado, will permit extension of these studies.

Previous estimates of the nation's reserve of shale oil have placed it at 92 billion barrels of recoverable oil. However, recent core drilling in the Rifle area has indicated that there may be as much as 200 billion barrels in Colorado alone. (Both estimates are based on a shale that will assay 15 gallons of oil per ton.) This material, at present of no commercial value, has certain basic advantages as a source of oil. It occurs in essentially horizontal strata containing an average of about 30 gallons of oil per ton of shale in a bed 70 to 100 feet thick in Colorado and extending in almost continuous but thinning beds into Utah and Wyoming.



N-T-U retorts for processing shale at the Oil-Shale Demonstration Plant of the Bureau of Mines near Rifle, Colorado. Towering cliffs of oil shale rise in the background.

Mining these thick beds permits a tremendous advantage over mining coal, which has to be dug from beds frequently only 1/20 or 1/10 as thick. Moreover, initial capital investment and operating costs both for mining and plant are much less than if coal is used as a raw material. There is no problem in locating necessary reserves, but the mountainous terrain in which they are found, frequently at 7,000 to 8,000 feet, and the aridity of some of the richest deposits makes plant site selection an important question. Availability of water will be one of the big factors.

Estimates on the cost of crude shale oil from large-scale operations run from $1.75 to $2.75 per barrel. Bureau of Mines experience, based on its plant at Rifle, indicates that shale oil can be produced for from $2.00 to $2.50 per barrel, including amortization of plant in 10 years but no profit. The capital cost of a plant to make the crude oil from shale is estimated at $2,000 per barrel day.

On the basis of pilot plant experience, a large oil company places the production cost as low as $1.75, while another says $2.75. One of these companies has already expressed its interest in building a commercial plant if the government will assist in the early stages of the work.

GAS SYNTHESIS PROCESS

Fundamentally, the gas synthesis (or Fischer-Tropsch) process involves the catalytic reaction of carbon monoxide with hydrogen to produce straight-chain or isoparaffins (about 10 per cent or more) type hydrocarbons (and some unsaturated compounds) in the liquid range. Carbonaceous materials, such as any coal, coke, natural gas, or lignite, can be used as the raw material by converting them with steam and oxygen to a mixture of carbon monoxide and hydrogen. This mixture in the proportion of either 2 volumes or 1 volume of hydrogen to one volume of carbon monoxide (depending on the catalyst) is purified and then passed over a catalyst at relatively low pressures (1 to 20 atmospheres) and temperatures from 300 to 400 F. to form oils and waxes.

Although this process yields certain characteristic products, some variation is possible through selection of catalyst and operating conditions. With cobalt catalysts, a Diesel fuel of 80 to 100 cetane number is produced, while the gasoline is only about 45 octane. With iron catalysts, a poorer Diesel fuel, but a higher octane gasoline (70) suitable for motor fuel is produced. At present, high-octane aviation gasoline with good rich-mixture performance is not obtainable at low cost.

The proposed construction of two plants to produce from 6,000 to 7,000 barrels a day of hydrocarbon products —one by Carthage Hydrocol, Inc., at Brownsville, Texas and the other by the Stanolind Oil and Gas Company in the Hugoton gas field in Kansas— speaks well for the rapid adaptation of the gas synthesis process to natural gas. Efficient processes for burning natural gas with steam and oxygen to provide the synthesis gas have been developed. Moreover, the cumbersome and expensive converters that the Germans used since 1944 to produce 18 barrels a day of oil per unit have been replaced by converters with daily outputs of over 1,000 barrels. These embody a new catalyst in fluidized form to overcome the drawbacks of expensive catalyst and high heat evolution that characterized the German units.

Other companies are pursuing the same type of activity on a smaller scale. Pilot plants with capacities of 1 to 10 barrels a day are being operated.

Since private companies have exerted such great efforts in applying this process to natural gas, the Bureau of Mines has largely concerned itself with the utilization of coal for this purpose. The German process of coking coal and then forming water gas has been replaced by a continuous gasification unit that does not require coking coal, of which there are relatively limited reserves. Powdered coal, oxygen, and steam are fed into the unit and the raw materials for the gas synthesis process are taken from it. This type of unit on which the development work begun in Germany was brought to completion at the Morgantown, Virginia, and Bruceton, Pennsylvania, laboratories of the Bureau of Mines, will be incorporated in the design of the demonstration plant to be erected at Louisiana, Missouri.

Other features of the Louisiana installation will be a plant brought over from Germany which extracts oxygen from the air for the gasification, and a newly developed Fischer-Tropsch converter with good temperature control and high capacity. The plant will produce 50 to 80 barrels a day of Diesel oil or motor fuel.

Another potential source of synthesis gas is underground gasification of coal. An experiment carried out last year at Gorgas, Alabama, by the Alabama Power Company and the Bureau of Mines showed that this method can utilize a high percentage of the coal. It is believed that if the operation is conducted under pressure with oxygen, very high temperatures and a suitable gas can be obtained. However, much specialized development work would have to be undertaken to solve the peculiar problems of each bed exploited in this fashion. More work on this problem is contemplated by the Bureau of Mines and industry, and major improvements in underground gasification can be expected.

Several groups other than the Bureau of Mines are doing work on the utilization of coal in the gas synthesis process. The Pittsburgh Consolidated Coal Company in cooperation with the Standard Oil Development Company is building a pilot plant to gasify and carbonize coal as a first step toward furnishing raw material for such operations. If this work is successful, it will be used as a basis

of design for plants to make city gas as well as gasoline and oil. The Koppers Company of Pittsburgh also is reported to have done some experimentation on powdered coal gasification and to be ready to start work on the gas synthesis process.

Of approximately 149 trillion cubic feet of natural gas in the United States, it is estimated that up to 30 trillion might be available for conversion to liquid fuels. From this, a total liquid product of 4 to 5 billion barrels could be expected. The locations of plants to use this gas would be very limited. For an economic unit making 10,000 barrels of oil a day, a locality with 1 trillion cubic feet of gas exclusively for the plant, and large supplies of water (15 million gallons daily) is necessary (based on an assumed plant life of 25 years). Although large reserves are concentrated in Kansas, Oklahoma, Louisiana, and California, heavy pipe-line demand restricts the number of locations that could supply this total of 1 trillion cubic feet of gas. Moreover, some areas which have sufficient gas cannot meet the water requirement. Therefore, assuming that gas to pipe lines will not or could not be curtailed for large-scale synthetic liquid fuel installations, the industry would be located largely on the Gulf Coast and in Southwest Texas. Here light pipeline and other demand for the proved reserve of 40 trillion cubic feet of gas, plus locations near the coast with ample water should fulfill requirements. Moreover, the Fischer-Tropsch plants could be operated in conjunction with the condensate operations of units that recover natural gasoline by condensation.

For a plant of the same size using coal as the starting material, numerous sites are offered in more than 20 states with good coal reserves. However, since the plant should be at the mine mouth and since the water requirements are much the same as for the natural gas plants, economy in costs of transportation of coal and water would again impose limitations. This water problem would be less severe in the east. The question of location in relation to markets must be decided on the basis of cost of coal versus cost of transportation of oil and gasoline. Eastern coal deposits may be more expensive to mine, but they are nearer the large markets for the fuels, while many western coals can be mined cheaply and easily, but the liquid product will have to be shipped. Sufficient data is on hand to determine the most economical location for a particular set of circumstances.

Secretary of the Interior J. A. Krug's statement, in his report for 1947 on the Synthetic Liquid Fuels Act, that his department is awaiting operation of the demonstration plant at Louisiana, Missouri, to verify cost estimates for the gas synthesis process using coal is indicative of the present lack of good economic data. A rough estimate is that the capital investment for such a plant will run from $9,000 to $10,000 per barrel day from coal to the finished product. The greatest portion of this will go for the production of synthesis gas, which engineers estimate will cost under optimistic assumptions 10 or 12 cents per 1000 cu. ft. from a good grade of coal at $3 a ton. Any major reduction from the $3.50 to $4.50-a-barrel oil this yields will have to result from lower costs of the gas.

The opening of the proposed commercial plants in Texas and Kansas will provide more data on actual production costs. With the advantage of natural gas available at about 5 cents per 1000 cu. ft., these petroleum companies estimate that a product competitive with natural petroleum can be produced. The most recent estimates tend to be lower, with talk of gasoline produced at 7 to 9 cents per gallon. Because of these economic considerations, it is evident that low-cost natural gas will be the first commercial source of synthetic liquid fuels.

HYDROGENATION OF COAL

Coal-hydrogenation involves liquefaction of coal by the introduction of hydrogen into the complex coal molecule, and the removal of oxygen to produce a compound similar in chemical structure to petroleum. This is accomplished by heating a paste of approximately equal parts of finely pulverized coal with heavy oil from the process at 800 to 900°F. in a high-pressure steel vessel and introducing hydrogen at pressures of 3,000 to 10,000 psi in the presence of a catalyst, usually iron sulphate or tin oxide.

After separation of all ash and non-liquefiable material, the product is distilled into light-, middle-, and heavy-oil fractions. The heavy oil is recirculated to make more paste, while the light oil is refined directly into gasoline. The middle fraction is further hydrogenated by passing it with hydrogen over a fixed catalyst in a vapor phase converter. The high proportion of naphthenes and aromatic hydrocarbons in the oil from this process makes it particularly suitable for the production of aviation gasoline. In fact, practically all the aviation gasoline supplied to the German air force during the war was made by this process. At present it is the only synthetic process adaptable to large-scale operations that will product a 100 octane gasoline with excellent rich-mixture characteristics. Diesel oil from coal-hydrogenation cannot compete in quality, nor motor gasoline, probably, in price, with those from the Fischer-Tropsch. Light hydrogenation of coal at low pressure, however, has excellent possibilities as a method for producing fuel oil.

Work on this process is being done by the Bureau of Mines at the demonstration plant under construction at Louisiana, Missouri. Although design and fabrication of high pressure equipment new to American industry has been a serious problem, the plant is scheduled for completion in July. Capacity of the installation will be

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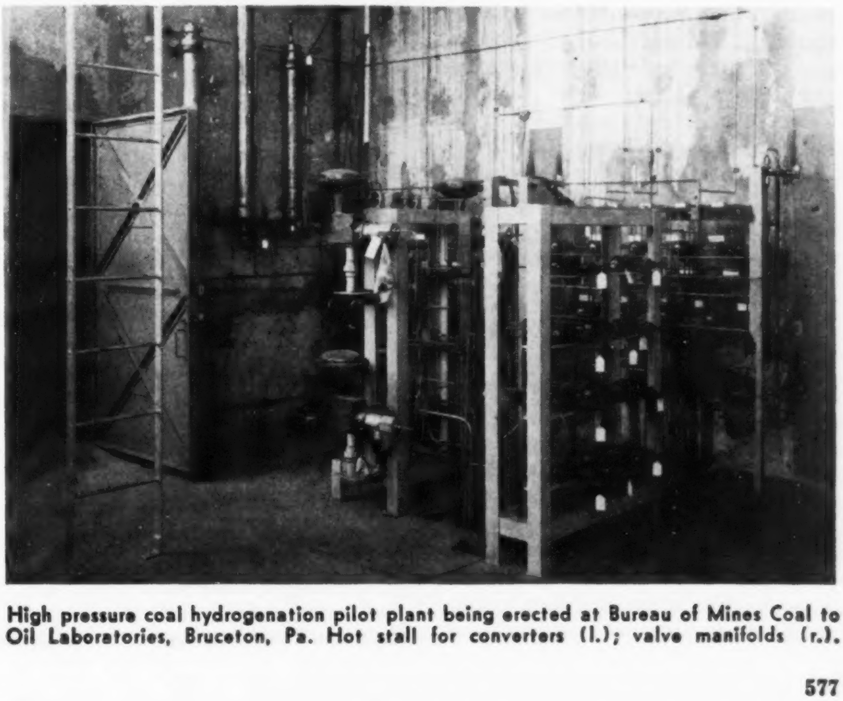


High pressure coal hydrogenation pilot plant being erected at Bureau of Mines Coal to Oil Laboratories, Bruceton, Pa. Hot stall for converters (l.); valve manifolds (r.).

A **CI** REPORT ON

U. S. CHLORINE: Where It Is Made and

WHERE IT IS MADE

by Ralph K. Lamie, Consulting Chemical Engineer
H. K. Ferguson Co., New York, N. Y.

INCREASES in chlorine facilities since war's end have again remade the face of the industry, and more are coming.

MOST of the 50 plus chlorine plants in this country were erected during one of the several "eras" of expansion in the industry.

One of the first periods of growth started in 1898, when most of the producers in the Niagara Falls area and some in Michigan built the first sections of their plants. The second cycle of chlorine construction provided the chlorine for World War I. Curiously, many of the plants were relatively small units erected by paper mills cut off from their normal supply because of wartime demands placed upon their regular suppliers. The third era of growth began in the mid-thirties and hasn't stopped yet. It can be subdivided into three distinct phases.

THE THIRD ERA

The mid-thirties expansion was the greatest. Need for chlorine increased as the demand for ethyl gasoline, glycol and other chlorinated materials increased. Of particular interest was the non-electrolytic plant of the Solvay Process Co. started at Hopewell, Va. in 1936; Ethyl Corp. built an 85-ton plant at Baton Rouge, La. for production of metallic sodium and chlorine in 1938; Columbia Chemicals Division of Pittsburgh Plate Glass Co. erected the first unit of its chlorine plant at Barberton, Ohio in 1936; and Michigan Alkali (now Wyandotte Chemicals Corp.) built a 50-ton plant at Wyandotte, Mich. in 1938.

Several smaller producers constructed plants to augment their own basic processes. The first chlorine-caustic unit (35 tons per day) of the Southern Alkali Corp., a joint subsidiary of Pittsburgh Plate and the American Cyanamid Co., began operations in 1938. There was also considerable expansion of existing facilities, notably by Westvaco Chlorine Products Corp., whose original plant began operations in 1916.

The second phase of our present era of growth consists of the construction during the war years. Daily production increased more than a thousand tons. The four plants of the Chemical Warfare Service alone contributed 300

UNITED STATES

Owner or Operator	Location	Year Started	Estimated‡ Daily Tonnage
Belle Alkali Co.	Belle, W. Va.	1917	18
Clorox Chemical Co.	Oakland, Calif.	?	4
Clorox Chemical Co.	Chicago, Ill.	1943	—
Clorox Chemical Co.	Jersey City, N. J.	1942	—
Colorado Fuel & Iron Co. (CWS)	Denver, Colo.	1943	100
Diamond Alkali Co. (CWS)	Edgewood, Md.	1942	50
Diamond Alkali Co.	Houston, Tex.	1947	220
Diamond Alkali Co.	Painesville, Ohio	1928	87
Diamond Alkali Co. (CWS)	Pine Bluff, Ark.	1943	50
Dow Chemical Co.	Freeport, Tex.	1940	300
Dow Chemical Co.	Velasco, Tex.	1942	
Dow Chemical Co.	Midland, Mich.	1897	235*
Dow Chemical Co.	Pittsburg, Calif.	1917	69*
DuPont de Nemours & Co., E. I.	Deepwater Point, N. J.	1928	12*
DuPont de Nemours & Co., E. I.	Niagara Falls, N. Y.	1898†	100*
Ethyl Corp.	Baton Rouge, La.	1938	120
Fields Point Mfg. Corp.	Providence, R. I.	1921	7
Frontier Chemical Co.	Seagraves, Tex.	1947	10
General Electric Co.	Pittsfield, Mass.	1943	25
Goodrich Co., B. F.	Louisville, Ky.	1942	25
Gulf Refining Co.	Port Arthur, Tex.	1917	15
Hercules Powder Co.	Hopewell, Va.	1939	16
Heyden Chemical Co.	Memphis, Tenn.	1943	25
Hooker Electrochemical Co.	Niagara Falls, N. Y.	1898†	100
Hooker Electrochemical Co.	Tacoma, Wash.	1928	100
Innis-Speiden Co.	Niagara Falls, N. Y.	1898†	20
Mathieson Alkali Works	Niagara Falls, N. Y.	1898†	106
Monsanto Chemical Co.	East St. Louis, Ill.	1922	17
Morton Salt Co.	Manistee, Mich.	1934	0.1
National Lead Co.	Sayreville, N. J.	1943	1.5
Niagara Alkali Co.	Niagara Falls, N. Y.	1898†	70
Penn. Salt Mfg. Co.	Tacoma, Wash.	1928	60
Penn. Salt Mfg. Co.	Portland, Ore.	1947	60
Penn. Salt Mfg. Co.	Wyandotte, Mich.	1898	150
Pittsburgh Plate Glass Co.	Barberton, Ohio	1936	140
Pittsburgh Plate Glass Co.	Natrium, W. Va.	1943	200
Potash Co. of America	Carlsbad, N. M.	1940	3
Rayo Chemical Co.	Los Angeles, Calif.	1942	6
Solvay Process Co.	Baton Rouge, La.	1937	42*

Where It Is Used

tons of this: 100 tons at Huntsville, Ala.; 50 tons at Pine Bluff, Ark.; 50 tons at Edgewood, Md.; and 100 tons at Denver, Colo. A 225-ton plant, now operated by Stauffer Chemical Co., was built for the magnesium plant to be operated by Basic Magnesium, Inc., at Las Vegas, Nev., and a 200-ton plant was built by DPC at Natrium, W. Va. and later purchased by the Columbia Chemical Division of Pittsburgh Plate Glass Co.

Several other sizable installations were completed during the war years: Dow Chemical Co.'s estimated 300 tons per day divided between Freeport and Velasco, Texas; Heyden Chemical Company's 25 tons at Memphis, Tenn.; B. F. Goodrich Co.'s 25 tons at Louisville, Ky.; General Electric Co.'s 25 ton plant at Pittsfield, Mass. All of these were in addition to those constructed at existing plants in order to meet accelerated wartime demands.

The third phase of the third era's expansion, which has been underway for almost fifteen years, is the huge volume of postwar construction. Outstanding this category are two large plants, located on the Gulf Coast; the 240-ton plant owned by Southern Alkali Corp. at Lake Charles, La., and the 220-ton plant owned by Diamond Alkali Co. at Houston, Texas. Pennsylvania Salt Manufacturing Co. has completed a new unit in Portland, Ore., and Hooker Electrochemical Co. is expanding its Tacoma, Wash. plant, which has been in operation since 1928. Other smaller plants have been or are being constructed.

The results of this unprecedented expansion have increased United States chlorine production to 4,400 tons per day, or 1,600,000 tons annually. During 1948 an additional 540 tons daily is expected to come in, making an anticipated annual production capacity of just over 1,800,000 tons by December 31, 1948. This is just short of 5,000 tons per day.

CHLORINE PLANTS

Owner or Operator	Location	Year Started	Estimated‡ Daily Tonnage
Solvay Process Co.	Hopewell, Va.	1936	70
Solvay Process Co. (CWS)	Huntsville, Ala.	1943	100
Solvay Process Co.	Syracuse, N. Y.	1927	65*
Southern Alkali Corp.	Corpus Christi, Tex.	1938	50
Southern Alkali Corp.	Lake Charles, La.	1947	240
Stauffer Chemical Co. (Basic Magnesium)	Las Vegas, Nev.	1942	225
Stauffer Chemical Co.	Niagara Falls, N. Y.	1898†	45
Texas Carbon Industries	Sayre, Okla.	1934	1.2
Westvaco Chlorine Prods. Co.	So. Charleston, W. Va.	1916	304
Wyandotte Chemicals Corp.	Wyandotte, Mich.	1938	150
Zonite Corp.	New Brunswick, N. J.	1930	—

* This figure is capacity as of 1940. It is believed, however, that these plants were expanded during and since the war.
‡ It is difficult to estimate capacity because management's decision on the current density to be employed can vary with market conditions.
† Approximate

PAPER INDUSTRY

Bare Paper Co., D. M.	Roaring Springs, Pa.	1905†	1
Brown Co.	Berlin, N. H.	1898	36
Castanea Paper Co.	Johnsonburgh, Pa.	1905†	11
Champion Paper & Fibre Co.	Canton, N. C.	1916	33
Champion Paper & Fibre Co.	Hamilton ,O.	1941	—
Champion Paper & Fibre Co.	Houston, Tex.	1936	20
Eastern Manufacturing Co.	South Brewer, Me.	1916	6
Ecusta Paper Co.	Pisgah Forest, N. C.	1947	4
Kimberly-Clark Corp.	Kimberly, Wisc.	1936	15
Oxford Paper Co.	Rumford, Me.	1916	12
Penobscot Chemical Fibre Co.	Great Works, Me.	1916	6
Southern Advance Bag & Paper Co.	Hodge, La.	1936	12
Warren & Co., S. D.	Cumberland, Me.	1916	8
West Virginia Pulp & Paper Co.	Lake, Md.	1917	6
West Virginia Pulp & Paper Co.	Mechanicsville, N. Y.	1917	11
West Virginia Pulp & Paper Co.	Tyrone, Pa.	1905†	6
West Virginia Pulp & Paper Co.	Covington, Va.	1917	12
	TOTAL		4013.8

EXPERTS WERE WRONG

At war's end many members of the industry feared that there would soon be serious over-production of chlorine. In fact, several foreign governments made attempts to purchase the four Chemical Warfare Service plants then thought of in terms of postwar "surplus" facilities insofar as American requirements were concerned.

But as everyone now knows, the anticipated chlorine surplus never materialized. Chlorine is in even greater demand today than it was during the war. One factor in particular has contributed to this.

Some chlorine producers have adopted a policy of using more of their chlorine output themselves—either as a processing material or to produce end products containing chlorine. The reasoning behind this is that it is more profitable to sell end products than it is to sell chlorine as such. This thinking has extended to the point where practically all major chlorine producers are rapidly beginning production of organic chemicals utilizing large quantities of chlorine and/or caustic at some point in their manufacture.

GEOGRAPHIC SHIFTS

In the early days the American

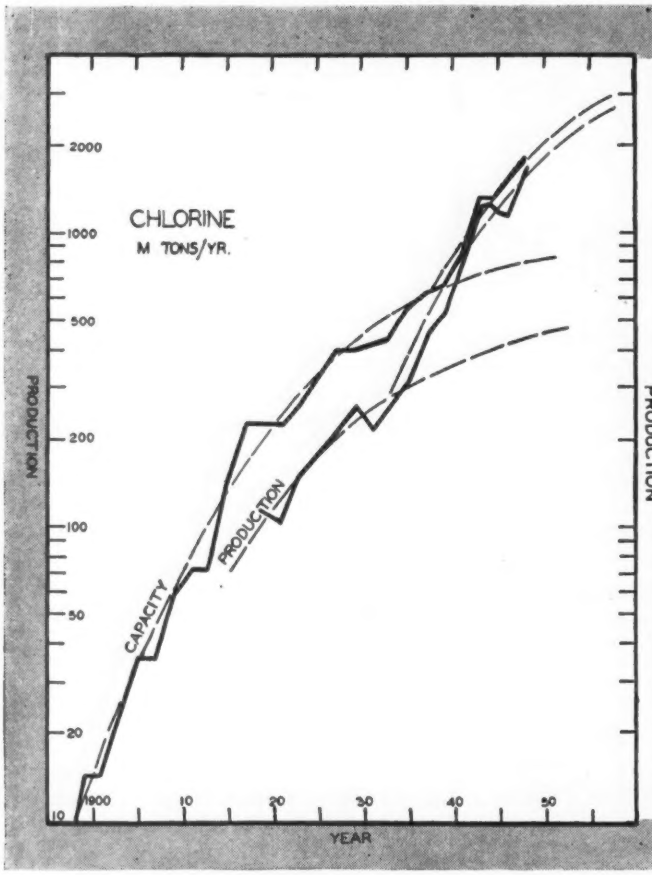


Figure 1

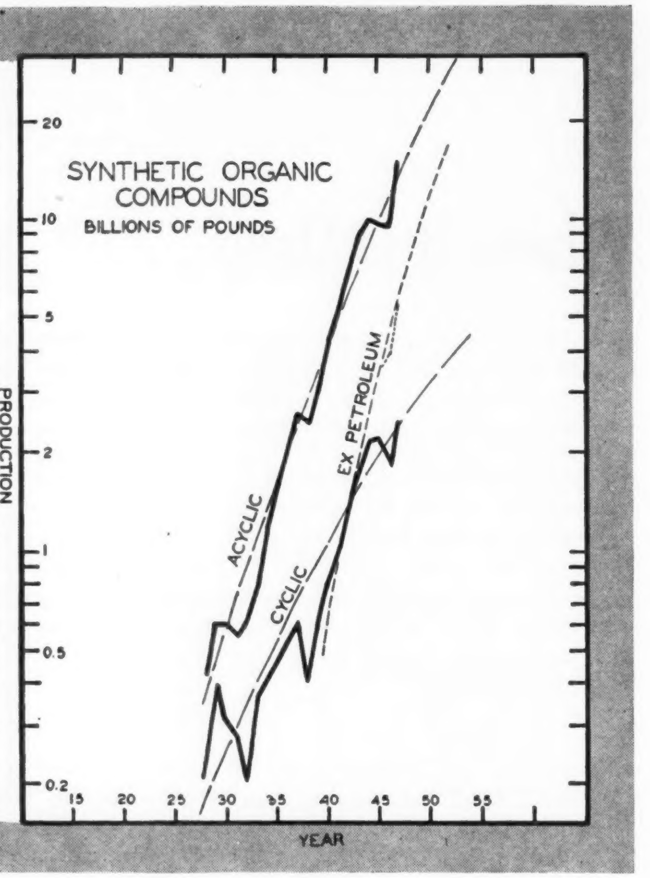


Figure 2

chlorine industry was concentrated in the Niagara Falls area and in Michigan, where it remained for many years after the first flurry of large-scale production in 1898. In the early 1900's, several small plants, supplying paper mills, were constructed in Pennsylvania, and in 1916 several more small plants were built in Maine, not too distant from the first New England plant constructed in 1898 by the Brown Co. at Berlin, N. H., also a paper mill.

The year 1916 also marked the beginning of large-scale production in the Charleston, W. Va., area, when Westvaco installed the first unit of its present 300 ton per day plant. The following year, 1917, saw the first move to the Southwest and West. The Great Western Electrochemical Co., now part of the Dow Chemical Co., constructed a large plant in Pittsburgh, Calif., and Gulf Refining Co., built a 15 ton plant in Port Arthur, Texas. Further expansion in the Southwest did not take place until almost two decades later, when Solvay constructed a 42-ton plant in Baton Rouge, La., in 1937.

The next step in the development of the industry in the Far West occurred in 1928 when Pennsylvania Salt Manufacturing Co. and Hooker Electrochemical Co. erected facilities for chlorine production in the Pacific Northwest with plants at Tacoma, Wash. In the same year, Diamond Alkali built a new plant at Painesville, Ohio, not far from Cleveland.

The wartime chlorine production expansion knew no geographical limits. The plants constructed by the War Department were located at widely scattered points such as Huntsville, Ala., and Pine Bluff, Ark., in the mid-South; in Edgewood, Md., and in Denver, Colo. (The Pine Bluff and Edgewood plants are now operated by Diamond; Huntsville is operated by Solvay; and Denver is operated by the Colorado Fuel & Iron Co.)

The industrial area around the Ohio River between Pittsburgh and Cincinnati—already represented by Westvaco's 300-ton plant at S. Charleston, West Virginia—was bolstered with a 200-ton plant at Natrium, West Virginia, owned by Columbia Chemicals.

GROWTH IN THE SOUTHWEST

The Southwest has had the largest expansion in chlorine production in the war and postwar periods. This area, which had barely more than a hundred tons daily of production a decade ago, now approaches a thousand tons daily production, more than 20% of the entire production in the United States.

During the war, Dow, the largest producer of magnesium, built plants at Freeport and Velasco, Texas, that will produce an estimated 300 tons per day. Since the war, two more giant plants are being constructed in this area, a 220-ton plant by Diamond Alkali at Houston, and a 240-ton plant by Southern Alkali at Lake Charles, Louisiana. Frontier Chemical Co. has added a 10-ton plant at Seagraves, Texas.

There are many explanations for this shift to the Southwest. The outstanding perhaps is that chlorine has naturally followed other industries in the industrialization of this part of the United States. There is a ready market for the output in the refining of petroleum, the manufacture of paper and in the processing of various organic compounds now being produced in the Southwest. Here there is a good supply of cheap power and salt plus other raw materials to serve as a basis for further processing. The extent of this use can best be determined from the data accompanying the next article in this issue.

The second most significant increase in production from a sectional standpoint has been in the Pacific Northwest, around Tacoma and Portland. Here again, some of the factors responsible for the growth of the industry in Texas apply. The principal demand, however, arose from the paper industry. Both raw materials and power are available, and a program for diversification of industries guarantees a future market.

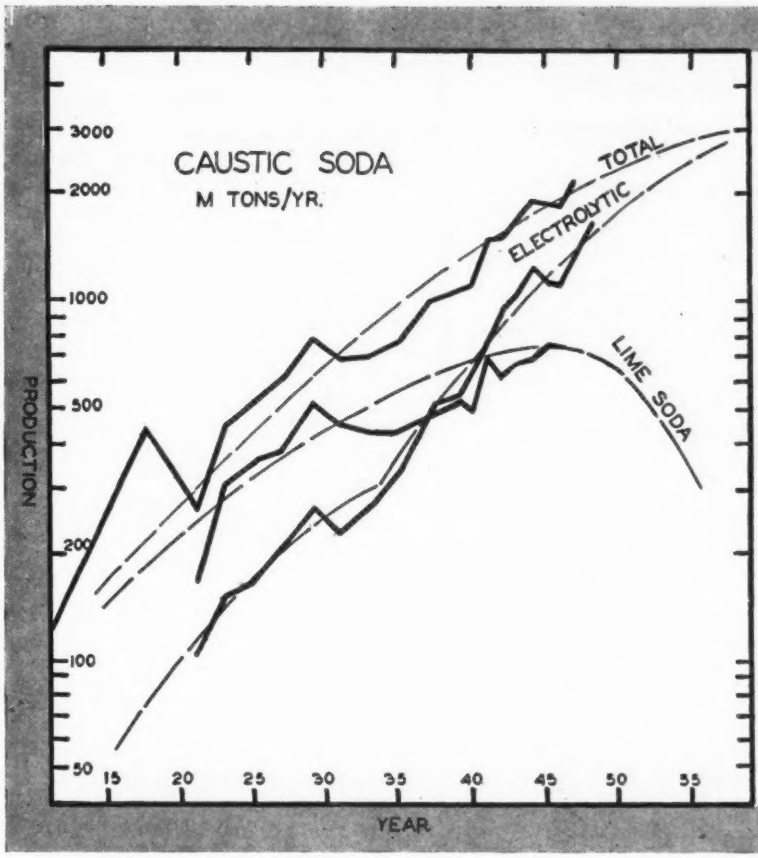


Figure 3

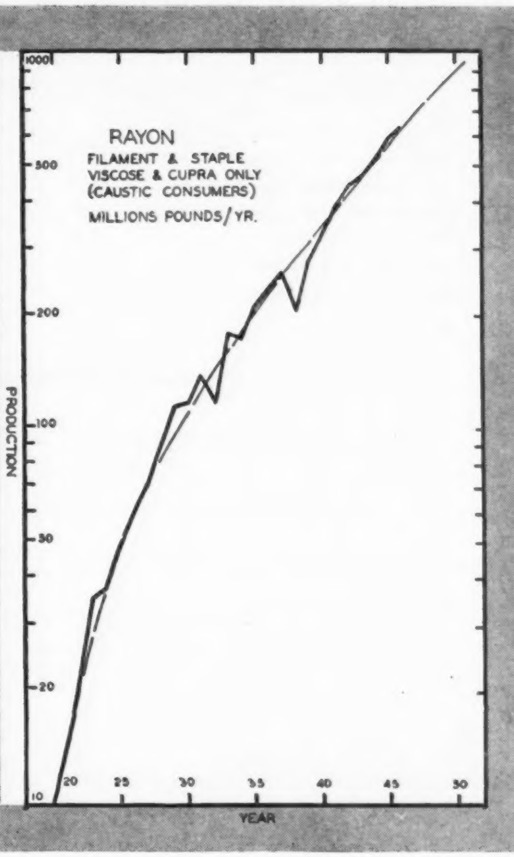


Figure 4

WHERE IT IS USED

by ROBERT B. MacMULLIN
Robert B. MacMullin Associates, Niagara Falls, N. Y.

OVER 75 PER CENT of total chlorine output, or about 1,200,000 tons, is now going into production of chemicals, mostly organic.

IT has been said that the production of sulfuric acid is a basic gauge of the extent of industrialization of any country, but that the production of chlorine is a gauge of the refinements of the civilization within that country.

Chlorine is a "Cinderella" of chemical industry, an unwanted child in the early decades, now the belle of the ball of synthetic organic chemical industry. We pay her court and bring forth paper and textiles that are white and easy on the eyes; potable water for teeming populations of crowded cities; solvents for keeping our clothes perennially clean; plastics that are an improvement over any materials found in nature for textile fibers, films and solid objects; insecticides to curb insect pests; fungicides and plant hormones to make gardening easy; and refrigerants that have revolutionized our eating habits.

GROWTH

The growth of the chlorine industry is illustrated in Figure 1. Reliable production figures prior to 1920 are not available. The capacity curve in reality should be a series of steps rising as new plants were brought in. The smoothed capacity curve is a typical trend curve which applies to all commodities. Such growth curves level out as time goes on, and may even decrease because of some technological change. It sometimes happens, however, that technological change gives a new stimulus to an industry, superimposing a new growth curve on the old one. This apparently happened in the case of chlorine in 1938. Judging by the new trend curve, chlorine in 1948 is still in swaddling clothes.

Prior to 1933 production averaged about 60% of installed capacity. Since that date the margin has narrowed until production has been at about 90% of capacity during the war years and since. This simply means that the incentive for building new chlorine plants is very great indeed, and will continue until there is a more favorable margin between production and capacity.

WHAT HAPPENED IN '38

Why this new lease on life which shows up so dramatically in 1938? The answer is found in the growth of the synthetic organic chemical industry, shown on Figure 2.

There are two curves, one for cyclic compounds (chiefly aromatic) and one for acyclic compounds (chiefly aliphatic). Cyclic compounds are chiefly derived from coal tar; acyclic compounds from alcohol, acetylene, petroleum and natural gas. The cyclic industry is much older and more mature than the acyclic industry, as exhibited by the flattening out of the growth curve. In the early 1930's use of petroleum as a raw material for organic chemicals began—both acyclic and cyclic. The lusty growth of this industry is illustrated by the very steep curve labeled "ex petroleum." At present about one-third of all our organics are made from petroleum, and this fraction is increasing rapidly.

Since chlorine is one of the important chemical raw materials used in the manufacture of organics, the demand for chlorine is roughly proportional to the demand for synthetic organics. On or about 1938 the demand for chlorine caught up with capacity, and chlorine plants had to be built, war or no war. This is illustrat-

TABLE 1—ESTIMATED END USES FOR CHLORINE

	1940	Est. Annual Rate End of 1947	
Pulp Bleaching	21 %	11 %	175,000 tons
Disinfectants and Sanitation	6 %	4 %	63,000 tons
Textiles	5 %	3 %	47,000 tons
Chlorinated Products	60 %	77 %	1,210,000 tons
Miscellaneous Uses	8 %	5 %	77,000 tons
Total	100 %	100 %	1,570,000 tons

TABLE 2—CONSUMPTION OF CHLORINE IN ORGANIC CHEMICALS

(Rough Estimate of Annual Rate at End of 1947)

Product	Production, Tons per Year	Chlorine Used, Tons
Benzene Chlorination		
Monochlorobenzene (net)	162,000	120,000
Dichlorobenzene (o and p)		35,000
Phenol		64,000
Diphenyl and diphenyloxide		5,000
Aniline		12,000
Benzene hexachloride		3,000
Bromine for Ethylene Dibromide		12,000
Carbon Tetrachloride	100,000	150,000
Chloroform		18,000
Ethyl Chloride*		50,000
Tri and Perchloroethylene	175,000	220,000
Ethylene and Propylene Chlorination		
Ethylene dichloride	70,000	50,000
Acrylonitrile		5,000
Dichloroethyl ether		6,000
Glycols and oxide	100,000	134,000
Vinyl and Vinylidene Chloride	88,000	62,000
Neoprene*	52,000	21,000
Chloral	25,000	50,000
Amyl Chlorides (net)	9,000	9,000
Keryl Chlorides		25,000
Chlorinated Paraffin	10,000	10,000
Aluminum Chloride (for alkylation)		40,000
Total		1,101,000 Tons
Total to chlorinated products, approx.		1,210,000 Tons

*The HCl used is derived in part from salt and sulfuric acid.

TABLE 3—U. S. CHLORINE CAPACITY AND PRODUCTION

Total installed capacity, December, 1946	1,543,165 tons
Total planned or under construction	274,000 tons
Total estimated capacity, December, 1948	1,817,165 tons
Production, 1945	1,192,081 tons
Production, 1946	1,165,120 tons
Production, 1947	1,365,000 tons
Production, estimated, 1948	1,600,000 tons
Captive chlorine, estimated for 1946	73 %
Captive chlorine, estimated for 1947	70 %
Captive chlorine, estimated for 1948	68 %

ed further by Table 1, showing the approximate end uses for chlorine in 1940 and in 1948.

TODAY

The rate of chlorine production as of today is approximately 1,500,000 tons per year. Of this, approximately 77%, or 1,200,000 tons, goes into chlorinated products. It would be difficult to account for all of this chlorine, but about 90% of it is represented in Table 2. Three items alone account for over 600,000 tons, roughly half of the chlorine used for synthetic organics. A high degree of accuracy is not claimed for the above figures, but they are of the right order of magnitude.

It should be pointed out that in interpreting the growth curves we have ignored the cyclic variations from the trend, produced by business cycles, wars and disasters. One can not specifically say how much additional chlorine capacity will be built in a given year in the future. However, in spite of a cyclic trend downward there would seem to be an urgent and unsatisfied demand for additional chlorine capacity of about 1,400 tons per day, or 500,000 tons per year, over the next five-year period.

Recent history and a short forecast are given in Table 3. Of interest is the relation between captive and non-captive chlorine. Captive chlorine is defined as chlorine that is produced and consumed in the same plant. Also, a large fraction of the non-captive chlorine is sold for specific purposes on long term contract to neighboring chemical plants. Therefore, the chlorine which reaches the open market is very much less than that indicated in the table.

Thus the new chlorine plants at Lake Charles, La., and Houston, Texas, are almost wholly for the specific purpose of supplying new plants making glycerine, glycols, solvents and vinyl compounds in the immediate area.

CAUSTIC

In any discussion of electrolytic chlorine some attention must be given to the other member of the two-horse team, caustic soda. Caustic potash and the alkali metals are also made to some extent in electrolytic chlorine cells, but by far the largest tonnage of the chlorine produced is in conjunction with caustic soda.

Caustic soda is derived from two sources, the lime-soda process and the electrolytic process. The growth curves for these two industries are shown on Figure 3. The first point of interest is that production of electrolytic caustic passed lime-soda caustic in 1940. The next is that the trend

curve for electrolytic caustic soda shows a break in 1932 which corresponds to the break in the electrolytic chlorine production curve in Figure 1.

Production of lime-soda caustic appears to be nearing a maximum. Following the usual cyclical course, an increasingly rapid rate of production decline is to be expected, unless of course there is some technological change which will increase the uses for caustic soda. Exports of caustic may take up some of the slack.

The end uses for caustic soda as of 1947 are shown in Table 4. In 1947 the rayon industry consumed 22% of the total production of caustic soda. Taking into account an expected 12% increase in rayon production by 1948, it is estimated that the rayon industry this year will take 510,000 tons of caustic soda, or 24% of the total caustic production. The growth of the viscose rayon industry is shown in Figure 4.

Of all the uses for caustic soda mentioned above, only rayon and some other miscellaneous uses require pure caustic soda, or what is known as rayon grade caustic. This grade of caustic is made by one of three methods:

(1) Lime-soda process.
(2) Mercury cell electrolytic process.
(3) Diaphragm cell electrolytic process with purification step added.

Lime-soda caustic is eventually doomed by the inevitable increased production of electrolytic caustic soda. The expanding rayon industry must therefore obtain the bulk of its caustic soda requirements from either mercury cell caustic or from purified diaphragm cell caustic. The total amount of mercury cell caustic produced today is approximately 83,000 tons per year with a probable increase to 135,000 tons per year in 1948. This is far short of the requirements for rayon grade caustic. It appears certain, therefore, that as lime-soda caustic becomes scarcer, either—and probably both—of the following will take place:.

(a) Increased demand for chlorine will be met by building more mercury cell electrolytic plants.

(b) Diaphragm cell plants will install purification plants to produce rayon grade caustic.

As was pointed out last July (CI, p. 41, July, 1947), the manufacturing cost of chlorine and pure caustic soda is somewhat less by the mercury cell process than it is by the diaphragm cell process. Thus the final conclusions must be:

(1) There is a real demand for more electrolytic chlorine plants in the United States.

TABLE 4—END USES FOR CAUSTIC SODA IN U. S., 1947

	Tons	%
Soap	110,000	5.3
Chemicals	460,000	22.1
Petroleum Refining	160,000	7.7
Rayon and transparent film	455,000	21.9
Lye and Cleansers	120,000	5.8
Textiles	105,000	5.1
Rubber reclaiming	27,000	1.3
Vegetable oils	20,000	1.0
Pulp and paper	130,000	6.2
Exports	130,000	6.2
Miscellaneous	363,000	17.4
Total	2,080,000	100.0
Estimated for rayon, 1948	510,000	

(2) The time is approaching when most, if not all, the caustic soda required by industry will be produced by the electrolytic process.

(3) The growing rayon industry, which requires pure caustic, will be cut off from lime-soda caustic, and the electrolytic industry must therefore make up the difference.

(4) Some of this pure caustic will be supplied by purification of diaphragm cell caustic.

(5) The newer electrolytic plants to be built should be of the mercury cell type, as this method produces rayon grade caustic cheaper than the diaphragm cell process with purification added.

HYDROGEN CHLORIDE

A problem of HCl disposal exists because a very large proportion of the chlorine produced enters into the manufacture of chlorinated hydrocarbons.

Chlorination of hydrocarbons is of three types:

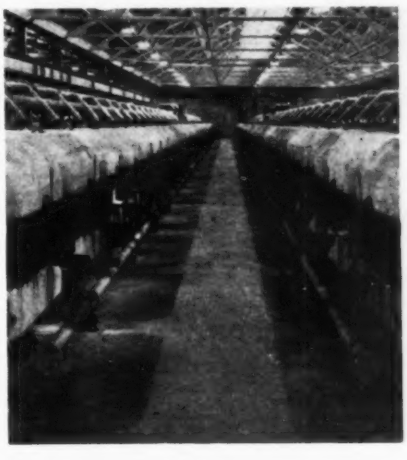
(1) Substitution of hydrogen by chlorine, with the resultant formation of hydrogen chloride.

(2) The addition of chlorine to unsaturated compounds, forming no hydrogen chloride.

(3) Addition of hydrogen chloride to unsaturated compounds. Since the substitution reactions greatly predominate, there is a potential production of hydrogen chloride from organic chlorinations amounting to almost 400,000 tons of HCl per year.

The production of hydrogen chloride, 100% basis, is currently at the rate of 420,000 tons per year. Part of this is produced from salt and sulphuric acid. It is certain, therefore, that much of the by-product hydrogen chloride from organic chlorinations never reaches the market.

To put it another way, in some localities, hydrogen chloride is deliberately produced from chlorine or salt, while in other localities hydrogen chloride is produced as a by-product for which there is no sale. Economic considerations rule out the transportation of large quantities of hydrochloric acid long distances. Therefore, there is a very definite need for



some process by which chlorine can be recovered from by-product hydrogen chloride.

The potential is believed to be equivalent to 150,000 tons of chlorine per year at the present time, and the trend is upward. It is obvious that any process for recovering chlorine in usable form from hydrochloric acid must give a cost as low as the cost of primary chlorine produced from salt. The exact situation differs from plant to plant within the industry and naturally will depend upon whether the chlorine used is purchased or whether it is manufactured by the plant in question.

This problem has been studied by many groups, but insofar as is known, only the Germans have actually practiced chlorine recovery from hydrogen chloride.

Economic Outlook for SYNTHETIC DETERGENTS

by MARCUS SITTENFIELD
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SKYROCKETING PRODUCTION AND CONSUMPTION of detergents and surface active agents has awed even some of the most optimistic in the industry. But as production and types of such products have increased, so has competition. Here is a nutshell economic appraisal of the outlook for the various types of detergents from a raw materials and cost standpoint.

Shampoo preparations is a field in which synthetics are gaining a strong foothold.

A NUMBER of the types of detergents and surface active agents now commercially available have unique properties or combinations of properties which place them pretty much in a class by themselves as far as certain uses are concerned. For an increasing number of uses, however, competition between types of detergents is very keen. And in such situations one of the most important factors is price. The cost of manufacture, source and supply of raw materials, ease of manufacture, are all important factors in evaluating the competitive position of surface active agents.

To go back a bit, the reasons for the development of synthetic surface active agents were two: (1) the shortage of natural fats, resulting in a decreased supply of soap, and (2) the desire to get compounds with properties superior to those of soap. The real development in this field began in Germany when that country was beginning its program of national self-sufficiency. Synthetic surface active agents were introduced into the U.S. about 1930 with the production of the sulfated fatty alcohols and the alkyl aryl sulfonated compounds derived from petroleum. Finally the quaternary and tertiary amines, ethylene oxide condensation products and the polyglycols were introduced.

Of these, soaps, the sulfated fatty alcohols, the sulfated monoglycerides, and the alkyl aryl sulfonates are the surface active agents in greatest competition with each other.

The soap industry is a tremendous one. The production of soap, other than liquid, as reported by the Association of American Soap and Glycerin Producers, Inc., in its soap sales census for the years 1944-1947, is as follows:

1944	3,273,000,000	pounds
1945	2,860,000,000	"
1946	2,315,000,000	"
1947	2,792,000,000	"

These data are for approximately 90% of the soap sold in the United States.

The price of tallow chip soap is quite erratic. As shown in the accompanying chart, tallow chip soap has varied from 13c per pound during the OPA period to a high of about 28c per pound in March and November of 1947. The market price of coconut oil and of tallow during 1947 and the first part of 1948 is also shown for comparison.

Since the raw material for soap is essentially an agricultural product, its supply and price is not entirely predictable. During the War, and since, political and world-wide economic factors have had a considerable influence on the supply of fats and oils. The great demand throughout the world for grain as human food portends a continuing meat shortage for the next few years. This will result in less cattle being raised and slaughtered. Consequently, tallow will be in short supply and tallow prices will remain up. In a U. S. Department of Commerce report[1], it is stated that the tallow and grease production during 1948 will be somewhat less than in 1946-47 unless the fat salvage campaign gains considerable impetus.

Coconut oil, the other principal fat used in soap manufacture, is obtained from foreign sources, which have but recently started to again produce and ship large quantities to the United States. Most of the coconut oil imported into the United States comes from the Philippines. There are other producing areas, such as the Netherland Indies and Malaya. They do not contribute to the United States supply of coconut oil primarily because there is a tariff differential favoring the Philippines.

Recent estimates of the coconut oil supply for 1948 made by the Department of Agriculture show that there will be a 10 to 20% decrease over 1947. This decrease results primarily from the destruction caused by typhoons and earthquakes at the end of last year in the Philippines that are reported to have destroyed a portion of the crop.

Some sources believe that despite this apparent shortage, the world-wide picture of increased production of copra in the East Indies and Malaya, combined with the increasing competition of petroleum based synthetic detergents will cause the price of fats and oils to be generally lower in 1948 than they were in 1947.

In general, however, it is expected that the price of fats and oils, and consequently of soap, will remain at comparatively high levels for some time to come. The recent sharp drop in fats and oils prices that occurred in February was due to certain anti-inflationary tendencies in all commodities. However, a declining trend is not anticipated unless there is a general business depression.

SYNTHETICS CONTINUE CLIMB

Surface active agents have become of increasing importance since their commercial exploitation in the United States in the early thirties. Table I

is a summary of the production of the major synthetic materials since 1940.

In 1945, the production of alkyl aryl compounds amounted to approximately 50 million pounds, while in 1946 this figure rose to 52,000,000 pounds. The production in 1947 was probably close to 100,000,000 pounds due to the entrance into the picture of Oronite Chemical Co. and the expansion of National Aniline and Monsanto's production facilities. The 1948 figure is expected to be much higher, as the full effect of these plant expansions will be felt, and still more new plants, such as that of the Atlantic Refining Co., will be coming in. Since these materials are sold at 35% active material concentration, their annual sales table for the years 1945, 1946 were about 143 and 148 million pounds respectively, and the estimated sales for 1947 were about 285 million pounds.

During the same period of 1945 and 1946, the production of sulfated and sulfonated fatty alcohols, amides, esters, etc. (but excluding sulfonated oils) amounted to approximately 56 million and 78 million pounds respectively. It is estimated that the 1947 production of these surface active agents was about 100,000,000 pounds. These materials are also sold with an average active ingredient content of 35%. On this basis, their sales for 1945 and 1946 were approximately 160 and 223 million pounds respectively, and for 1947 it is estimated that the sales were about 285 million pounds.

It is freely expected that the consumption of both these classes of surface active materials will increase in 1948, and that the production of the alkyl aryl sulfonates will increase about 50% as a result of increased sales campaigns and increased production facilities.

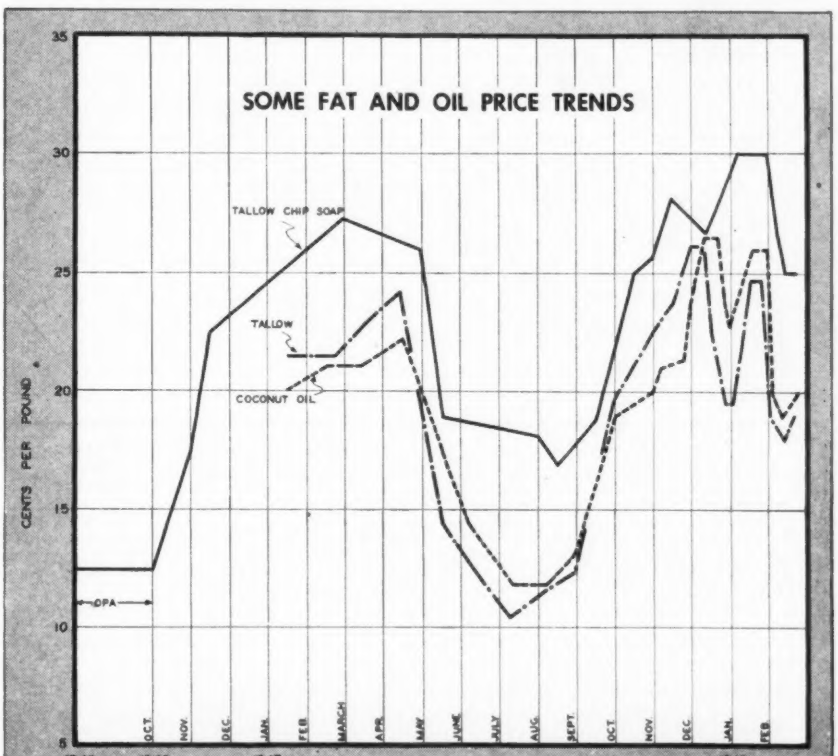
TABLE I—PRODUCTION OF SURFACE ACTIVE AGENTS 1941-1946
(in thousands of pounds)
Source: U. S. Tariff Commission Reports

	1941	1942	1943	1944	1945	1946
CYCLIC						
Quaternary NH_4 compounds, total	—	—	866	1,890	3,028	999
Sulfated & sulfonated compounds						
Benzenoid	—	—	24,748	31,453	41,717	45,868
Naphthalenoid	—	832	2,211	11,401	8,306	6,681
Petroleum sulfonates	—	—	—	29,520	15,376	36,598
All other cyclic surface active compounds	—	—	—	—	8,000	4,807
Total Cyclic	28,624	28,624	28,624	74,264	76,754	94,953
ACYCLIC						
N_2-containing surface active agents, total	—	—	—	—	1,985	3,627
Amide agents	—	970	483	1,133	1,757	3,192
Amine salts of fatty acids	—	—	—	—	228	—
All other	—	—	—	—	—	435
Polyhydric alcohol esters & ethers	—	—	—	—	6,000†	10,148
Salts of fatty acids, total	—	—	3,337	548	415	1,092
Sodium oleate	—	—	1,192	—	—	—
All other	—	—	2,145	—	—	—
Sulfated & Sulfonated acyclic surface active agents, total	—	—	—	—	98,743	129,377
Alcohols	24,123	23,559	—	14,049	—	—
Acids	—	—	3,337	3,41!	3,352	5,341
Amides	—	1,523	5,512	8,613	10,021	10,134
Esters	—	—	—	8,213	11,972	17,306
Oils, fats, waxes	—	—	11,240	28,436	30,484	38,337•
All other acyclic sulfated agents	3,837	5,141	23,109	27,636	30,926	58,259
Sulfonated paraffinic petroleum compounds	—	—	14,327	—	12,078	—
Total Acyclic	27,960	31,193	59,576	77,990	107,688	144,244
GRAND TOTAL	—	—	—	152,254	184,442	239,197

* Includes sulfated alcohols and sulfonated paraffinic petroleum compounds.
† Estimated.

The sulfated alcohols and sulfated monoglycerides are excellent detergents and, in addition, they are unaffected by hard water. The sulfated alcohols can also be used in acid solutions.

At present, the sulfated alcohols are made by one of two methods. In one coconut oil is reacted with sodium in the presence of methyl alcohol using the old Bouveault-Blanc synthesis. The other method is to hydrogenate the oil at about 250° C and at 2,000 to 3,000 pounds per square inch pressure using a copperchromite catalyst.



The sulfated fatty alcohols and sulfated monoglycerides are derived from agricultural products. Their price and the amount that can be manufactured are thus dependent on the same factors as were discussed in previous paragraphs in connection with soap.

Since the process for manufacturing these sulfated alcohol and glyceride compounds starts with the same raw materials as soap and goes through a more complicated series of operations, it would be expected that they would be more expensive than soap. The price of these compounds on a 100% basis varies between 60 and 90c per pound, which is considerably more than pure soap. However, for most purposes in which these materials compete with soap, concentrations of between 30 and 50% are used, and the selling price ranges between 21 and 45c per pound. Even at these prices, some of the synthetics are barely competitive with soap, and in other cases they are much higher priced. As long as the price of soap remains at the present comparatively high level, some of the higher priced synthetics will be able to compete on a per pound price basis. From this it may be concluded that, on a long range basis, these sulfated types of surface active agents will not offer serious competition to soap.

SYNTHETIC VS. NATURAL ALCOHOLS

There is another factor, however, which should be considered in this picture, and that is the possibility of ob-

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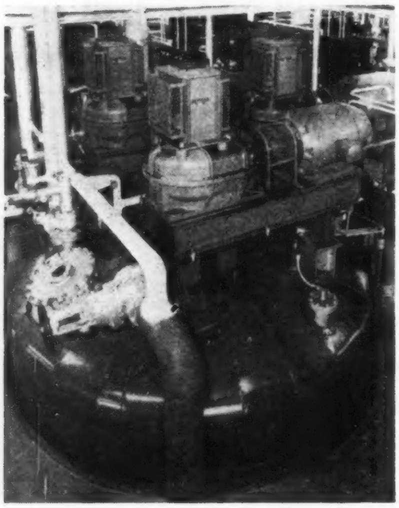


The Economics of Agitator Selection

by E. S. BISSELL, Technical Director
Mixing Equipment Company, Rochester, N. Y.

SELECTION OF THE PROPER MIXER is again becoming a precise engineering problem rather than one of ascertaining which of the available types will at least do the job. The factors which must be considered in selecting the most economical mixer are presented here.

During the war years the economics of agitator selection became obscured by selection of materials for short life in anticipation of a short war and by the general unavailability of most materials. Such conditions often forced a decision to take any available equipment, which frequently led to breakdowns and excessive costs.

Since the operating experience of many engineers was completely acquired during, or markedly changed by, these war-time conditions, a restatement of the economic factors involved in the selection of equipment for fluid agitation is in order. These factors include the materials of construction to be used, type of stuffing box to be employed, size of the mixer, power and maintenance requirements, and various other factors unusual to the specific job.

MATERIALS OF CONSTRUCTION

The materials of construction for an agitator must be chosen with great care. As minute traces of impurities, not even known to the operator as constituents of the system, can cause severe corrosion, all materials of construction should be selected by actual test by the user. Most manufacturers will furnish small samples of all standard alloys for such tests. Ordinarily there is no charge for this service, as the test samples are provided by the producers of the alloys.

Many satisfactory materials are available for coating and lining vessels where flow velocities are relatively low. If a coating, or covering, is suitable for a tank, it is natural to consider it for protection of the agitator. Unfortunately, this can not always be done and, even when possible, it is not always feasible. An agitator may be classed between tanks and pumps where special materials are required. For example, tanks can be made of wood, and paddle agitators frequently are made of wood, but no one would consider a wooden centrifugal pump. On the other hand, pumps can be made of Duriron, hard lead, porcelain and glass, but these materials are not suitable for agitators (except in very small sizes) or for tanks of normal size. A comparison is given in Table 1.

Whether a material is suitable for a given service can not be answered by a tabulation. Each material has its own individual peculiarities. As an example, let us consider two materials marked good for agitator service: homogenous lead bonding and rubber covering.

1. Neither material can be operated in a stuffing box. The stuffing box proper and wear sleeve on the shaft must be of a harder material and equally corrosion resistant.
2. A covered shaft and impeller assembly must be considered as an integral unit. It can not be taken apart for shipment, installation or maintenance. Failure to note this characteristic may lead to excessive installation or removal costs.
3. Neither material can be repaired readily or replaced easily in the field. Long shut-down periods, therefore, may be expected even with duplicate assemblies ready. In many cases these periods can not be anticipated.
4. Both materials deform the shape of the impellers and reduce efficiency.
5. Lead adds a heavy weight to bearings and supports. It may seriously alter the critical speed of the agitator shaft and require general "beefing up".
6. Rubber, if improperly applied as to temperature or thickness, will result in a "tender" coating—eroding rapidly at points of high velocity. A ⅛" coating of elastomer may give less than one-eighth the life of a ¼" coating when used in abrasive fluids. The thin layer provides no cushion and the surface stretches and breaks under the stress of motion and impact.

It is not implied or stated that these reliable, widely used materials are not suitable for agitator service—they are entirely suitable within their limitations. However, these limitations should be known and application made with caution.

COST

For large equipment, wetted agitator parts only, the approximate rela-

TABLE I

Material	Tanks	Agitators	Pumps, Valves, Piping
Wood	Excellent	Poor	Impossible except for pipes
Lead—Homogeneous Bonding	Good	Good	Good
Lead Sheathing	Good	Poor	Impossible
Hard Rubber	Good	Good	Good
Soft Rubber or Neoprene	Good	Good, if thick enough	Good
Glass Lining or Coating	Excellent	Excellent	Good
Plastic Coating	Fair for storage—no abrasives	Poor, rapidly erodes	Fair for pipes—no abrasives

tive cost of common materials is indicated below:

1—Plain Steel (taken as unity)
2½—Stainless Steel Type 304
2½—Everdur Bronze
3—Stainless Steel Type 316, Type 347—Monel
3¼—Type 317 Stainless Steel—Nickel
3½—Durimet — Worthite —Rubber Covering
4—Hastelloy — Homogeneous Lead Bonding

Reasons for these cost levels, other than the price per pound differential, are:

(A) In some alloys, standard nuts, bolts, keys, etc., are not on the market. Resort must be made to costly individual threading and milling etc.

(B) Low tensile alloys require larger shaft, fittings, etc.

(C) Coatings require special handling, design modifications, double freight bills to and from supplier, besides the cost of coatings applied.

It will be seen that economics do not favor substitution for solid metals on a price basis alone.

Cost are quite often increased by the attempts of the plant engineer, who is without special experience in the design of mixers, to save money by use of home-made equipment. Such attempts usually lead to unpredictable and generally unsatisfactory results.

MECHANICAL SEAL VS. STUFFING BOX

The general design and construction also affects the overall cost, both in original outlay for the mixer and the later outlay for loss of production due to down time. For example, with side entering mixers a frequent request is for the use of a mechanical seal rather than a stuffing box. However, a stuffing box can be maintained with ordinary materials on a simple maintenance schedule. The down time is a few hours at most, and the tank need not be emptied. A mechanical seal must be located a considerable distance from either end of the mixer shaft, and maintenance usually necessitates removal of the complete mixer, requiring emptying of the tank. In some cases men must enter the tank. If the loss of production time are considered with the cost of emptying the tank, etc., it will be seen that the small saving in annual maintenance of the seal, as compared with the stuffing box, may soon be overtaken by the cumulative cost for replacement of the seal.

INTEGRAL VS. SEPARATE STUFFING BOX

When an agitator with a stuffing box is required, the choice is between a unit with the stuffing box as in *integral part of the mixer*, or a unit with the stuffing box as in *integral part of the tank*. The latter is a carryover from the time when most processes were carried out in open tanks. Agitators developed for this condition were later adapted to pressure vessels by using a separate stuffing box. However, the successful adaptation depends upon (a) the tolerance of runout of the shaft (dependent upon type of bearing, etc.) and (b) the accuracy of overall alignment. Other factors involved are distortion of the vessel by temperature, by weight of contact, and by pressure.

The economic factors are complex and are related to:

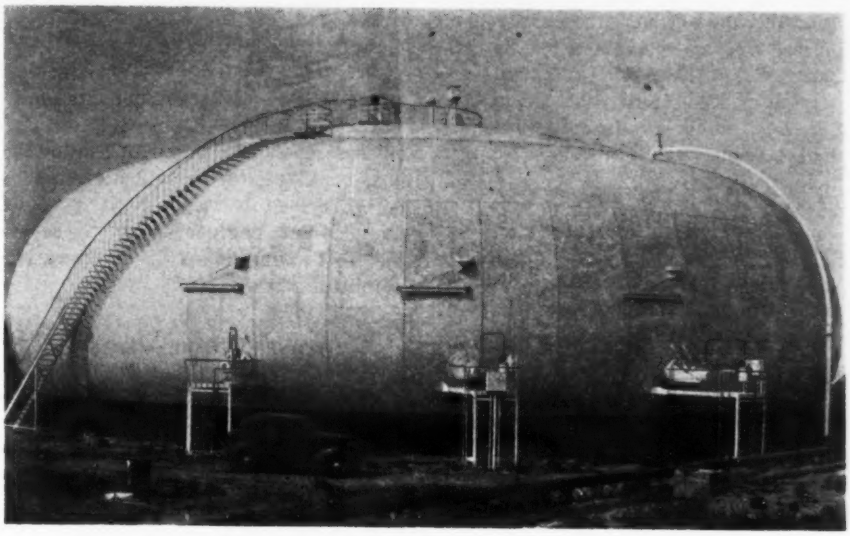
1. Type of service and amount of pressure for which stuffing box is intended.
2. Cost of external tank supports and extra millwright work for an agitator with a separate stuffing box, this cost to be balanced against slightly higher cost of agitator with integral stuffing box, plus the cost of the larger nozzle.

It should also be remembered that an agitator with integral stuffing box generally permits greater accuracy of alignment, a simpler installation, greater operating pressures, and an integral removal and transfer to other operations, if necessary. Safe rules to follow fall into several categories:

Pressure. For pressures over 50 psig, or for hazardous liquids and gases, an integral stuffing box construction is required. For lower pressures and non-hazardous conditions, separate stuffing boxes may be considered.

Labor Cost. In the design of a new plant only integral stuffing box construction can be considered. Labor savings will more than pay the slight difference, especially where several trades may be in conflict over certain functions. For established plants, with regular installation and maintenance crews, agitators with separate stuffing boxes may be considered for jobs in the proper pressure range.

Step Bearing. While present technology permits use of surprisingly long shafts without step bearings, they may still be required in very deep tanks. Where step bearings are required, use integral stuffing box construction only, since it is virtually impossible to line up the drive, the stuffing box and the step bearing in the field.


Side-entering mixers are standard for blending Ethyl fluid into gasoline.

Nozzle opening. In a vessel for mounting a separate stuffing box this may be as small as six inches. The opening in a vessel for mounting an agitator with integral stuffing box will range upwards from ten inches, depending upon the size of the mixer and the desirability of using this opening as a manway. The relative cost of the required openings, therefore, will depend upon the actual difference in nozzle size, the change in gage of metal for the vessel head required for the larger nozzle.

Materials of construction. The cost differential is small and in favor of integral construction for plain steel. The differential is in favor of the separate stuffing box as (a) more expensive alloys are used and (b) the difference in nozzle size becomes greater. The mounting nozzle need never be greater than eighteen inches in diameter since impellers can be split and the blades removed.

Cost of supports. In many cases, pressure vessels will support the weight of an agitator with integral stuffing box directly on the mounting nozzle. Therefore, the cost of the

larger nozzle must be compared with the cost of erection and external supports, usually of structural steel, interference with floor room and piping.

Summing up, the mixer should be selected for heavy duty requirements if it is to be operated continuously, to hold the total cost per year to a minimum. The materials of construction must be well suited to the application to reduce the replacement of parts due to corrosion. Finally, the elements of the mixer itself, such as stuffing box, gearing and other components, must be selected and combined to allow repairs and adjustments to be made in a minimum amount of time and, where possible, enable standard parts such as ball bearings to be purchased in the field.

MULTIPLE INSTALLATION VS. SINGLE LARGE INSTALLATION

It is not readily recognized by most engineers that there is a break point for practically all items of manufacture beyond which there is no saving by using a single large unit instead of several small units. In pumps, it is not uncommon to find a 100 hp pump selling at $5,200 and a 50 hp pump selling at $1,700. This difference in price is not due to weight alone. In all machining operations, every manufacturer has an upper limit on the size of pieces which can readily be handled. Also the higher volume of production achieved for the smaller units lowers the cost of production.

The break point, where the single large unit costs more than a multiple installation, will vary with the type of equipment. In the case of side entering mixers, this point is approached at 25-30 hp. For top entering units of the slow speed turbine type it is felt that the general break point comes at around 50 hp. There is conclusive evidence that three 50 hp units can be used more efficiently on a large tank than a single 150 hp unit. Added to this factor is the feature that with a multiple installation the units may be used singly or in combination. Thus, in case one of the units is down for overhaul, it is not necessary to shut down the unit completely.

BLENDING

In dealing with one of the mixing categories such as blending, in which horse power can be substituted for time, first, we are faced with the selection of a mixer to perform an operation within a specified time limit, or, second, to select the mixer which will give the best overall economy.

On first examination the designer is tempted to select the smallest possible mixer than can complete the operation within the permissible time limit. However, it is advisable here to determine the possibilities of increasing the production of the entire group of equipment in which the mixer is to be integrated. Also, minor design changes on other components may grately step up the production. If such is the case, a mixer of the lowest possible size later on will be found to be a serious bottleneck. If possible many plant engineers try to select mixers to complete a given operation within a single shift.

COST OF OPERATION VS. POWER REQUIREMENTS

Although power costs and power conditions vary widely throughout the United States, the following general conditions are recognized:

First, there is the plant producing its own power whose power plant is already loaded to the utmost safe limit. Here the only possible selection is the smallest possible mixer.

Second, cases exist where the electricity is purchased at an excessive demand charge, or where addition of further power-using equipment throws the consumer into a higher demand bracket. As in the first case, there is no choice but to select the lowest possible size for the agitator and ignore all other efficiency and economic factors.

Third, in some localities the demand charges are of no consequence but the actual cost per kilowatt hour is excessive. Here efforts should be made to select the agitator for the lowest number of kilowatt hours required for the operation. Ordinarily, this will lead to a selection of a larger mixer than in the first two cases. This is because the larger units are in general more efficient hydraulically, and the amount of power required to perform the operation will be less with the larger mixer.

UNUSUAL FACTORS

In our organization records are kept whenever possible on all recommendations and installations. These are kept on punch cards and can be sorted by product, by industry, or by physical characteristics of the materials being handled. The present state of mixing technology makes it necessary to keep such records. They provide the basis for the overall selection of mixers, other than the mechanical technology regarding horsepower of motor and type of impeller. This involves relatively simple power curves, the effect of viscosity, specific gravity, etc. In generalizing each specific application, it is necessary to select a mixer for the most adverse rather than the most favorable conditions.

A good example can be shown in blending of automotive and aviation fuel. Here, tanks are quite standardized as to general proportions for a given capacity. For a 15,000 barrel tank of standard dimensions, a 15 hp side entering agitator is generally recommended for blending automotive fuel with 3 cc. of tetraethyl lead per gal. in 1-2 hours. There are many installations in which the full two hours is required to complete the blending. On the other hand in a number of installations the blending time is actually less.

In one case, instead of the usual 15 hp unit for a 15,000 barrel tank, a 10 hp unit would still accomplish the blending. In running this down it was found that this user set all large tanks on heavy crushed rock foundations. This prevented the bottom from sagging when the tank was filled and materially increased the efficiency of mixing. Also, this user located the manway very carefully so that the mixer stream did not contact any of the supporting columns.

At one time an attempt was made to determine from each prospective customer whether columns would be in front of the existing manway, whether new manways would be installed, and the condition of the tank bottom. However, the customers resented answering so many additional questions for a simple blending operation, forcing resumption of the policy of recommending equipment for the most adverse condition.

In any event the best results can only be obtained by cooperation between the user and the vendor. Any specialized experience of the user relating to the construction of tanks or internal tank fittings, is most helpful. This experience can be utilized in various ways, but it can usually be reduced to a numerical factor to be applied to the results produced by the standard design procedure.

TABLE II

SUMMARY

Integral Stuffing Box — Use —	Separate Stuffing Box — Consider Only —
Where pressure is over 50 psig, or operating conditions are critical.	Where pressure is under 50 psig, and conditions are not critical.
Where labor cost is high	Where labor cost for installation is low or not charged to job.
Where vessel may be subject to distortion in use.	Where step bearing is not required.
Where external supports are more expensive than a large mounting nozzle, or not acceptable	Where vessel is not subject to distortion and external supports are acceptable.

A Guide to DDT Formulations

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THE EFFECTIVENESS OF DDT against a multitude of insects has resulted in a similar multitude of formulations—some good, some poor—designed to solve specific insect problems. Here an expert in the field tells how to manufacture successful DDT formulations.

THREE grades of DDT are recognized—technical, purified or aerosol grade, and pure[10]. Technical DDT is a mixture containing about 70 percent of 1-trichloro-2,2-bis(*p*-chlorophenyl)ethene (commonly referred to as *p,p*'-DDT), the major impurity being the *o,p*,-isomer, and has a setting point of at least 89° C. Purified or aerosol DDT is a partially refined grade, containing more than 90 percent of *p,p*'-DDT, and has a melting point of not less than 103°. Pure DDT is a highly purified grade of *p,p*'-DDT, melting point 108.5°-109.0° (cor.), and is used chiefly as a standard of comparison for special studies. The chemistry of DDT has been described elsewhere[11].

DDT formulations that have been used most generally may be classified as water-dispersible powders, dust mixtures, solutions, emulsions, and aerosols. The aerosols have been discussed elsewhere[8, 9, 12, 16], but examples of formulations, of the other classes are presented in this paper. Certain characteristics of DDT formulations have been presented by workers of this Bureau[24].

WATER-DISPERSIBLE POWDERS

Several methods, which include micronizing, wet ball-milling, and hammer milling, have been used to reduce DDT to particle sizes needed in water-dispersible powders for insecticide use. The method required is dependent upon the purity of the DDT and the proportion desired in the finished product. In the following discussion these powders are classified as containing (1) 90 percent or more of DDT and (2) 50 percent or less of DDT. Some changes in procedure may be required in processing DDT from different sources because of variations in its physical properties.

Powders containing 90 percent or more of DDT. Water-dispersible powders containing about 97 percent of DDT[18] may be prepared by micronizing the compound and then coating the particles to prevent caking during storage. Highly purified aerosol-grade DDT (melting point 106° C.) may be micronized without pretreatment. Less pure grades acquire a high electrostatic charge during micronizing, which, in addition to the softening caused by friction incident to grinding, results in excessive packing in the mill. Packing can be greatly reduced by pretreating the DDT with an aqueous solution of an antistatic agent, such as Aresklene 400* or Duponol ME, and then drying and grinding. About ½ pound of agent is required for each 100 pounds of DDT. After grinding, the DDT particles are coated by applying a film-forming agent such as Methocel in aqueous solution in a heavy-duty paste mixer, drying the paste, and grinding the cake.

Such a product is free-flowing and will resist caking during storage for several months at 65° C. It is prepared for use by mixing with water to form a paste and then diluting the paste to the desired concentration. Products of this nature are of value in cases where cost is not important and a minimum of inert residue is essential.

Water-dispersible powders containing about 90 percent of DDT[17, 18] and sufficient surface-active agent to give a dispersed water suspension of 1 per-

* The composition and sources of proprietary compounds are presented in table 1.

cent of DDT have been prepared by micronizing a mixture of DDT, an anticaking agent, a dispersing agent, and a wetting agent. Typical formulations are as follows:

	(a)	(b)	(c)	(d)
DDT	90	90	90	90
Anticaking agent	7	6	7.5	6.5
Wetting agent	—	—	0.5	0.5
Wetting-dispersing agent	3	3	—	—
Auxiliary-dispersing agent	—	1	—	1
Polymeric film-forming agent	—	—	2	2

Formulas (a) and (b) are in general useful only in soft or moderately hard water. Formulas (c) and (d) can be used in all types of water, including sea water. If DDT of high purity (melting point 106° C. or above) is used, formulas (a) and (c) will give products of good dispersibility. DDT of lower quality (melting point 103°-106° C.) will usually disperse more readily if formulated according to (b) or (d), which contain an auxiliary dispersing agent.

Anticaking agents are low-bulk-density diluents, the probable function of which is to separate the DDT particles and thus prevent packing in the mill during grinding or coalescence during storage. One of the most effective anticaking agents is Santocel 45-M, a silica aerogel having a bulk density of about 7 pounds per cubic foot. This material is incompatible with some dispersing agents that are highly effective for DDT, such as glue, gelatin, and some types of polyvinyl alcohol. Other anticaking agents that are more or less effectve and require modifications in the formulas presented above are C-730, Celite 209, Sec-A-Sil, Silene, Super Absorbit, and Superba. These modifications may require the use of a larger proportion of auxiliary dispersing agent to prevent flocculation when the product is diluted with water.

Some of the agents suitable for these formulas are as follows:

(1) Wetting-dispersing agents: Alkyl or alkyl aryl sulfonates, such as Aresklene 400, Igepon T, Nacconol NRSF, Santomerse D, and Santomerse No. 3.

(2) Auxiliary dispersing agents: Polymeric aryl sulfonates, such as Darvan No. 1 and Daxad No. 11.

(3) Polymeric film-forming agents: Elvanol 51A-05 or Methocel-400 (must be a nonfibrous type to permit uniform blending with the DDT).

(4) Wetting agents may be any of the wetting-dispersing agents listed above or other types that effectively reduce the surface tension of water.

The products obtained from the formulas presented are free-flowing and are prepared for use by mixing with water to form a paste and then diluting the paste to the desired concentration.

Wet ball-milling and dry hammer milling may be used for grinding mixtures containing 90 percent or more of any of the grades of DDT plus surface-active agents. The first process involves the additional step of drying the paste and regrinding the cake.

Hammer-milling mixtures of high DDT content[18]* requires precooling with solid carbon dioxide to prevent packing in the mill, and involves the hazard of moisture condensing on the cold particles under humid conditions.

In general, formulations of water-dispersible powders made with high-purity DDT (aerosol grade or better) present fewer blending and grinding difficulties than those containing technical DDT. Such difficulties may be largely overcome by extracting[18] the technical DDT with an equal weight of 95 percent denatured alcohol. The degree of purification obtained by this method suggests that a considerable proportion of the impurities which cause nonuniform blending or packing in grinding are located on the surfaces of the DDT particles.

Powders containing 50 percent or less of DDT. Water-dispersible powders containing 50 percent or less of DDT may be prepared from any grade of DDT. The method of preparation is dependent upon the purity of the DDT, the method of grinding, the particle size required, and the proportion of DDT in the product. Since technical DDT is the cheapest grade, it is generally used for such powders, but the physical properties of lots obtained from different sources are likely to vary sufficiently to require modification of processing methods. In general, a DDT that is not sticky and is relatively free of hard-packed agglomerates is processed most easily.

Mixtures containing about 50 per-

TABLE 1.—COMPOSITION AND SOURCES OF PROPRIETARY MATERIALS USED IN DDT FORMULATIONS

Name	Composition	Source
Diluents (High Bulk Density)		
Bancroft	Clay	United Clay Mines
Cherokee	do.	R. T. Vanderbilt Co.
Homer	do.	United Clay Mines
Sheridan 6	do.	do.
Topton	do.	do.
Type 41	do.	Southeastern Clay Co.
Diluents (Low Bulk Density)		
C-730	Hydrated alumina	Aluminum Co. of America
Celite 209	Diatomaceous earth	Johns-Manville Co.
Santocel 45-M	Silica aerogel	Monsanto Chemical Co.
Sec-A-Sil	Dehydrating silica gel	Permutit Co.
Silene	Calcium silicate	Pittsburgh Plate Glass Co.
Super Absorbit	Expanded vermiculite	Alexite Engineering Co.
Superba	Carbon black	Binney and Smith Co.
Solvents		
APS-202	Aromatic petroleum fraction	Socony-Vacuum Oil Co.
Aro-Sol	do.	Sun Oil Co.
Koppers 327	Coal-tar hydrocarbons	Koppers Co.
Velsicol AR-50	Alkylated naphthalene	Velsicol Corp.
Velsicol AR-60	do.	do.
Solvesso Toluol	Hydrogenated naphtha	Standard Oil Co. of N. J.
Solvesso Xylol	do.	do.
Solvesso 100	do.	do.
Surface-Active Agents		
Alkanol WXN	Sodium hydrocarbonsulfonate	E. I. du Pont de Nemours and Co.
Ammonyx 00	Oleyl dimethylamine oxide	Onyx Oil and Chemical Co.
Aresklene 400	Dibutylphenylphenol sodium disulfonate	Monsanto Chemical Co.
Darvan No. 1	Sodium salt of polymerized polyaryl sulfonic acids	R. T. Vanderbilt Co.
Daxad No. 11	Polymerized sodium salts of alkylnaphthalene sulfonic acids	Dewey and Almy Chemical Co.
Duponol ME	Sodium alkyl sulfates, principally lauryl sulfate	E. I. du Pont de Nemours and Co.
Elvanol 51A-05	Polyvinyl alcohol	do.
G-7596-D	Polyethylene derivative of sorbitan monolaurate	Atlas Powder Co.
Igepal C	Polyether alcohol condensate	General Dyestuff Corp.
Igepon AP Extra Concentrate	Sodium salt of sulfonated ethyl oleate	do.
Igepon T	Sodium salt of sulfonated ethylmethyloleylamide	do.
Methocel (400 cps.)	Methyl cellulose	Dow Chemical Co.
Nacconol NRSF	Sodium alkyl aryl sulfonate	National Aniline Chemical Co., Inc.
Pentamul 87	Pentaerythritol soya bean fatty acid monoester	Heyden Chemical Corp.
Pentamul 126	Pentaerythritol monooleate	do.
Santomerse D	Decylbenzene sodium sulfonate	Monsanto Chemical Co.
Santomerse No. 3	Dodecylbenzene sodium sulfonate	do.
Span 20	Sorbitan monolaurate	Atlas Powder Co.
Tween 20	Polyoxyalkylene derivative of sorbitan monolaurate	do.
Tween 85	Polyoxyalkylene derivative of sorbitan trioleate	do.
Triton X-100	Alkyl aryl polyether alcohol	Rohm and Haas Co.
Triton X-155	Alkyl phenoxy polyethoxyethanol	do.

* United States Bureau of Entomology and Plant Quarantine. 1945. Final report, May, 1944, to October 31, 1945, to Office of Scientific Research and Development. Section 2, pp. 5-7. (Unpublished.)

cent of DDT may be micronized to give products of desirable particle sizes. Hammer millng often results in high losses due to packing in the mill unless an anticaking agent is used and mill temperatures are carefully controlled. In both methods the ingredients are mixed as uniformly as possible and then ground. Products containing 10 percent or less of DDT may be ground successfully by either method. The ingredients may be intimately blended by a preliminary coarse grinding followed by a fine grinding.

The kind of diluent to be used depends on the physical properties of the DDT and on the DDT content and the desired storage quality of the product. The diluent may be of low or high bulk density. The first type is illustrated by the anticaking agents, which have been mentioned. Examples of the second type are pyrophyllite, talc, calcite, and clays.

Since DDT is not wetted by water, surface-active agents are usually added when the DDT and diluent are blended prior to grinding. Powders containing equal weights of technical DDT and a kaolin-type clay, such as Cherokee, Homer, Sheridan 6, Topton, or Type 41, are readily mixed with water without the aid of wetting agents.

A new aerosol formulation should be thoroughly tested to make sure that the insecticidal material doesn't precipitate out and clog the nozzle after storage or upon use.

DUST MIXTURES

Dust mixtures containing 10 percent or less of the technical DDT are prepared by grinding a blend of this material with a diluent or by diluting a previously ground concentrated mixture. The blends may be hammer-milled in batches without serious packing in the mill. Continuous grinding may develop enough heat to cause troublesome packing, in which case some means of controlling mill temperatures may be required. Dilution of concentrated mixtures is often used, as thereby it is possible to obtain a lower grinding cost per pound of DDT. Any of the diluents mentioned above or others of similar nature may be used. Some of the concentrated mixtures may tend to pack and be distributed in agglomerates, but uniform distribution may be accomplished by passing a preliminary mix through a hammer mill or by brushing through screens.

SOLUTIONS

In the selection of a solvent for the preparation of DDT solutions, not only must its ability to dissolve at the temperature at which it is used and at which it is stored be considered, but also its phytocidal effect and its fire hazard, as well as other factors. Technical DDT is generally used in the preparation of solutions because it is cheaper than the other grades. It often contains insoluble material, which may require removal by filtration to prevent clogging of small orifices or to yield a clear solution. In exact formulations an allowance should be made for the amount removed by filtration.

DDT solutions often contain more than one solvent. In this event it should be recognized that the DDT capacity of a system containing both high- and low-capacity solvents[19] may not equal the sum of the DDT capacities of the components. Likewise, more high-capacity solvent is required to raise the solubility of DDT in a system containing kerosene from 5 to 10 percent than to raise it further from 10 to 20 percent. Furthermore, the DDT capacities of solvents vary widely at normal and subnormal temperatures. Consequently, it is suggested that each DDT-solvent system be subjected to testing.

DDT solutions are often prepared as concentrates for later dilution with cheaper solvents which may be of low capacity[13, 19]. The following high-capacity solvents have been found to dissolve between 100 and 105 grams of DDT per 100 grams of solvent at 25°-26° C.: cyclohexanone, tetrahydrofuran, thiophene, methyl ethyl ketone, isophorone, mesityl oxide, and dimethyl formamide. Of these solvents only cyclohexanone and isophorone have flash points above 37.8° C. The first-named has been used most extensively. Solvents having DDT capacities ranging from 45 to 70 grams per 100 grams of solvent at 25°-26° C. are APS-202, Aro-Sol, cyclohexene, ethylene dichloride, Koppers 327, 1-methylnaphthalene, Velsicol AR-50, Velsicol AR-60, Solvesso Toluol, Solvesso Xylol, Solvesso 100, and xylene. Combination systems containing Solvesso Toluol or Solvesso 100 have DDT capacities above the calculated amounts. Mixtures containing 80 pounds of Solvesso Toluol or Solvesso 100 and 20 pounds of cyclohexanone have DDT capacities of 100 and 75 grams of DDT, respectively, per 100 grams of solvent. The combination with Solvesso 100 gives a 42-percent DDT solution with a flash point above 51.7° C. Another combination that has been used extensively, particularly in atomized foliage sprays, consists of DDT 1 pound, xylene 1 quart, and enough kerosene to make 1 gallon of solution[22]. Since the composition of technical DDT is variable, the solubility of a specific lot in a given solvent may differ from published data based on pure DDT.

Of the low-capacity DDT solvents, petroleum fractions such as Stoddard's solvent, kerosene, and low-gravity fuel oils have been used most extensively. DDT is more soluble in kerosenes obtained from aromatic naphthenic-base petroleums than in those obtained from paraffinic petroleums[6]. In general, the solubility of DDT in kerosene increases as the aniline point decreases. The solubility of DDT in 100 ml. of kerosene at 27°-30° C. ranges from 4 grams for odorless kerosene to 16 grams for other types.

To DDT solutions that are to be applied on ponds and other bodies of water it may be desirable to add a spreading agent[20]. Oleic acid, Pentamul 87, Pentamul 126, and Triton X-

Household formulations must be foolproof for users cannot cope with difficulties.

100 have been used for this purpose in from 1 to 2 percent concentration.

EMULSIONS

DDT emulsions are generally prepared by diluting with water an emulsifiable concentrate consisting of a solution of DDT in an organic solvent and an emulsifying agent. High-capacity solvents are generally used in such systems. One formulation that has been used extensively consists of DDT 25 percent, Triton X-100 10 percent, and xylene 65 percent (all by weight)[14]. This system is readily emulsified on pouring into water. Other emulsifying agents that are at least equally as efficient as Triton X-100 for use with DDT-xylene or DDT-Solvesso solutions are Alkanol WXN, Ammonyx 00, Triton X-155, and a mixture of equal amounts of Span 20 and Tween 20[14, 17, 23]. One such concentrate[21] consists of a 90:10 mixture of Solvesso Toluol and cyclohexanone, 50 percent; DDT, 44 percent; and Ammonyx 00, 6 percent (by weight). The proportion of emulsifying agent may be reduced by about one-half if extremely small particle size or permanence of the emulsion is not essential or if agitation can be maintained following dilution with water.

Emulsions of this type which contain volatile solvents, upon evaporation of the water and solvent, leave on the sprayed surfaces a coating of noncrystalline DDT, which later crystallizes. Emulsions made with less volatile solvents, such as light lubricating oils, coat the surfaces with a solution on evaporation of the water. Such products may be made by dissolving the DDT in a commercial emulsifiable mineral oil or by adding a concentrated DDT solution to such commercial products.

In the formulation of DDT emulsions the use of solvents appreciably soluble in water should be avoided, because they may cause precipitation of DDT and clogging of spray equipment.

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MECHANICAL ACTIVATION OF REACTIONS

MECHANICAL activation, a newly developed chemical technique that uses a metal-cutting process to produce a chemical reaction, will enable certain organometallic reactions to compete commercially with current methods of synthesis, according to M. C. Shaw, assistant professor of mechanical engineering at M. I. T.

In this process a metal cutting fluid encounters a rather unusual combination of conditions at the point of a cutting tool. The fluid is subjected to high local pressures of the order of the hardness of the metal cut, high local temperatures limited only by the melting point of the work material and nascent, highly stressed metal surfaces.

Organometallic reactions have failed to assume great commercial application for several reasons. While some of the reactions are among the most versatile and universally applicable available to the organic chemist, they are generally toxic, highly inflammable and difficult to control.

During a study of the basic mechanism of cutting-fluid action, he said, it was found that certain organic reagents when used as cutting fluids react vigorously with the metal cut even though these same chemicals were relatively inert to the uncut metal in bulk.

This interesting discovery suggested the possibility of using a metal-cutting process to carry out reactions between metals and liquid or gaseous reactants. Subsequent tests showed that a metal-cutting process could be used to advantage in starting and controlling certain reactions involving metals.

The metal involved in the preparation is cut in the presence of the other reactants, thus utilizing the high-temperature, high pressure, and highly stressed nascent surface produced at the point of cutting to start the reaction.

This new chemical technique which has been called mechanical activation promises to give many extremely versatile organometallic reactions a commercial significance which they have heretofore lacked because their application was limited to batch rather than continuous processes by the inflammability and toxicity of the reactants and the difficulty of starting and controlling the reaction.

THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE

Wilbur A. Lazier, new director of chemical research, Chas. Pfizer & Co., Inc.

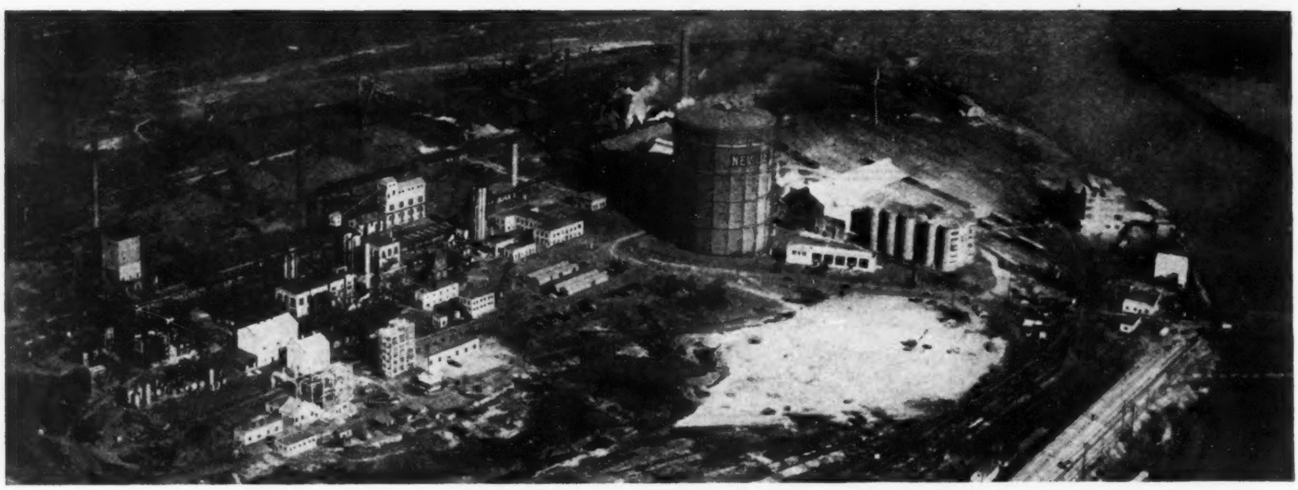
James L. Rodgers, Jr., general manager, American Cyanamid Co.'s new plastics and resins division.

George Oenslager, awarded first Charles Goodyear Medal for rubber achievements.

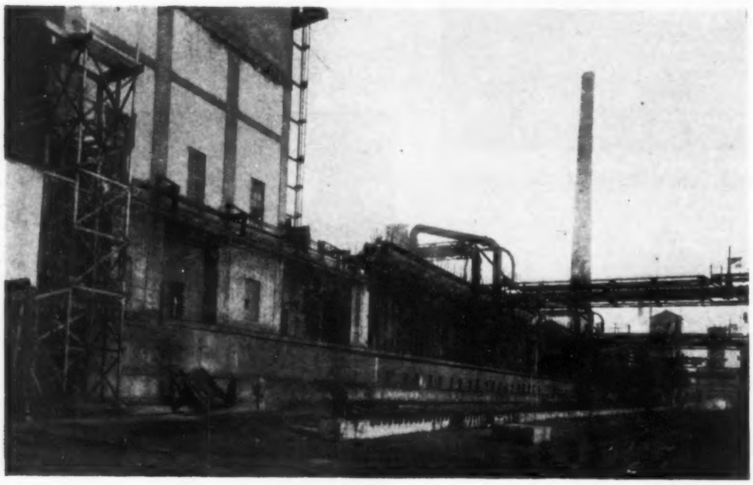
George B. Baylis, recently elected secretary of Hercules Powder Company.

John A. Hutcheson, appointed director of Westinghouse Research Laboratories.

Fred H. Schultz, Jr., named director of pharmaceutical research, Commercial Solvents Corporation.



Aerial view of Pittsburgh Coke & Chemical Company plant at Neville Island, Pittsburgh.



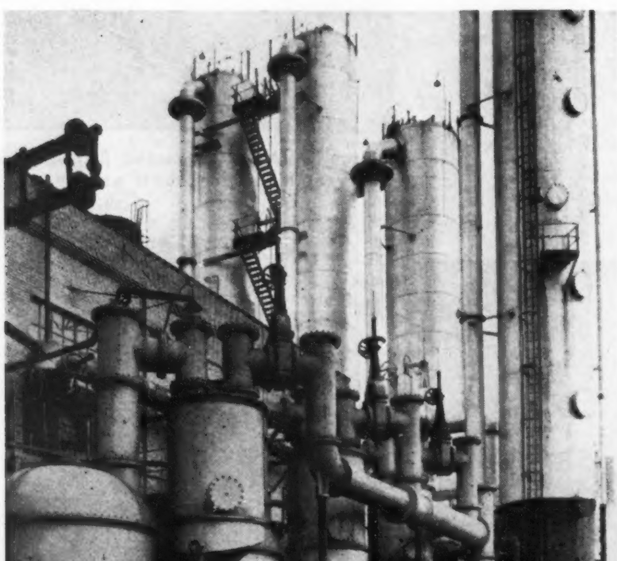
By-product coke ovens showing collecting mains going to chemical plant.

From Coal Mine

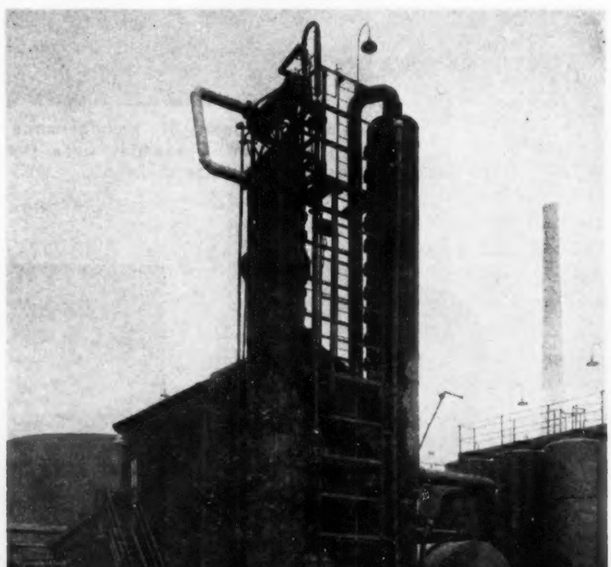
Pittsburgh Coke & Coal Company occupies an enviable position in industry in that its integrated activities permit it to market as finished chemicals, materials dug out of its own mines as coal. Barges deliver the coal to its plant on Neville Island in the Ohio River where in making coke, gases and tars are produced from which many useful chemicals are extracted and purified.

Tar is first removed from the gas. In a Wilton still, the crude tar is separated into five fractions that are further refined to yield light oils and residue for mixing with pitch, naphthalene, light and heavy creosote, phenols, and cresols.

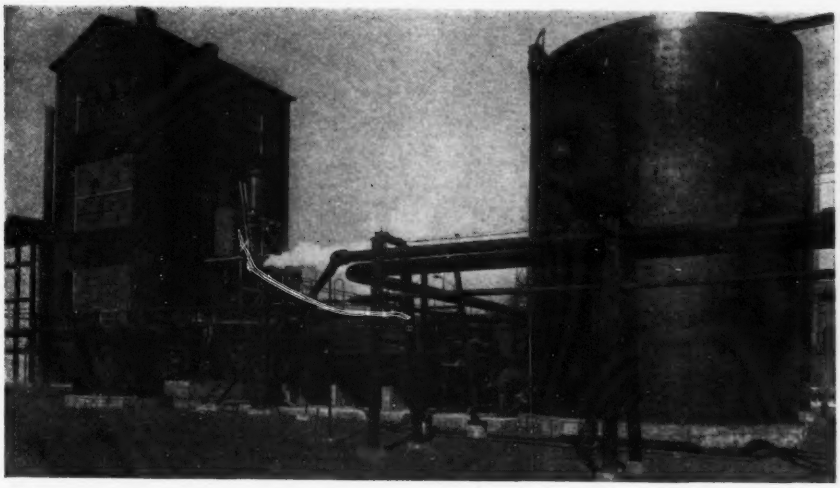
After the tar is removed, ammonia is recovered as ammonium sulphate. Next, scrubbers remove a mixture of benzol, toluol, xylene and solvents for further refining. The final purification



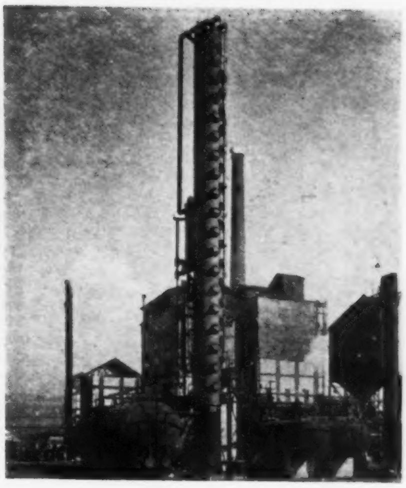
Ammonia saturators which convert by-product ammonia gas into ammonium sulfate, which is used as a fertilizer in agriculture.



Benzol scrubbers where benzol and other light oils are taken out of the by-product gas for processing into many products.



Wilton Tar Still where crude tar is refined and separated into its constituents.



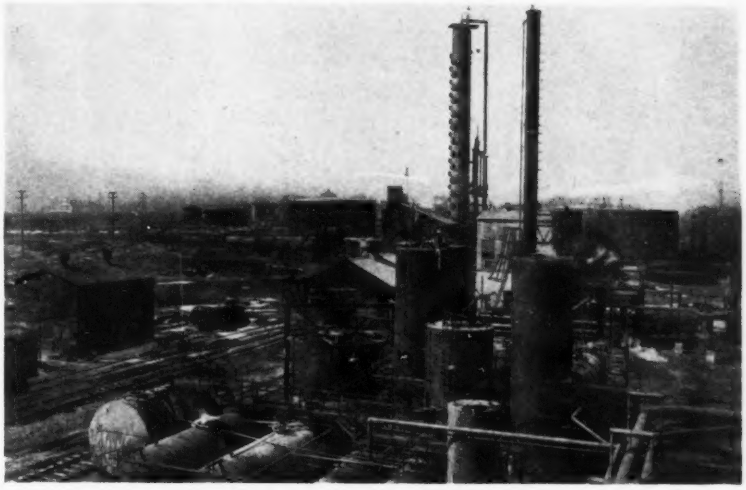
Naphthalene Still further refines.

To Consumer

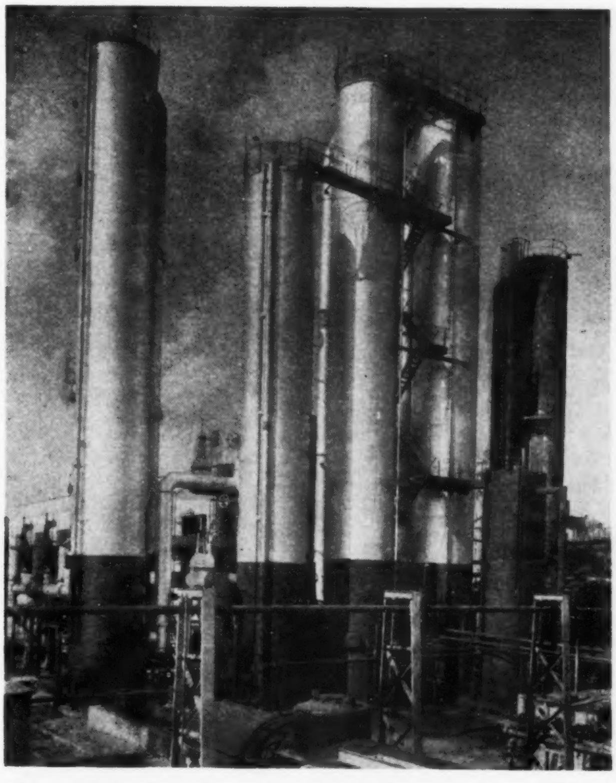
of the gas is the removal of hydrogen sulfide for production of sulfuric acid. In this step, hydrogen cyanide also is recovered.

Some of these recovered chemicals are sold in purified form, while others are the raw materials for such compounds in the company line as dinitro ortho cresol, phenyl mercury compounds, and 2,4-D selective weed killer.

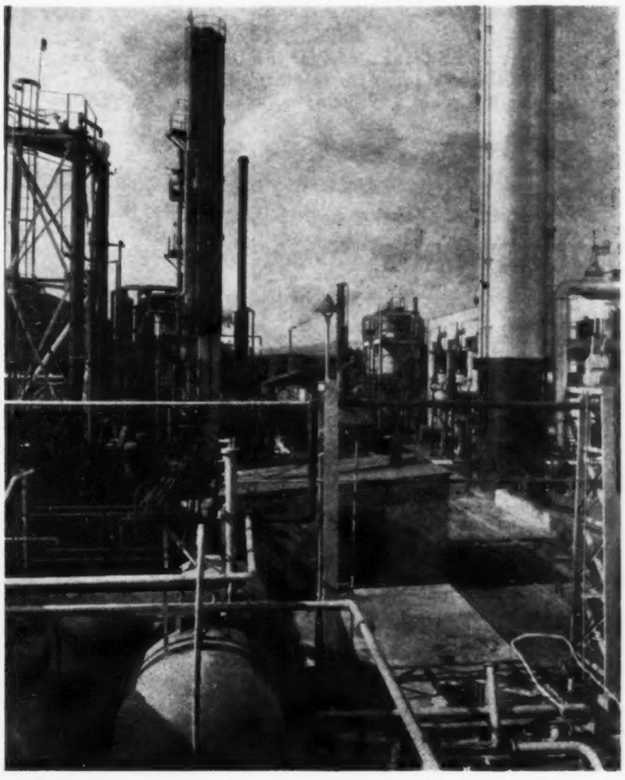
A $2 million expansion program will be devoted in large part to agricultural chemicals, many of them based on the products of the Neville Island plant. Among these will be benzene hexachloride, organic phosphate insecticides, a new cotton defoliant, quaternary ammonium compounds, general purpose weed killers, estrogen compounds for poultry, methylated naphthalene solvents and sodium thiocyanate derivatives.



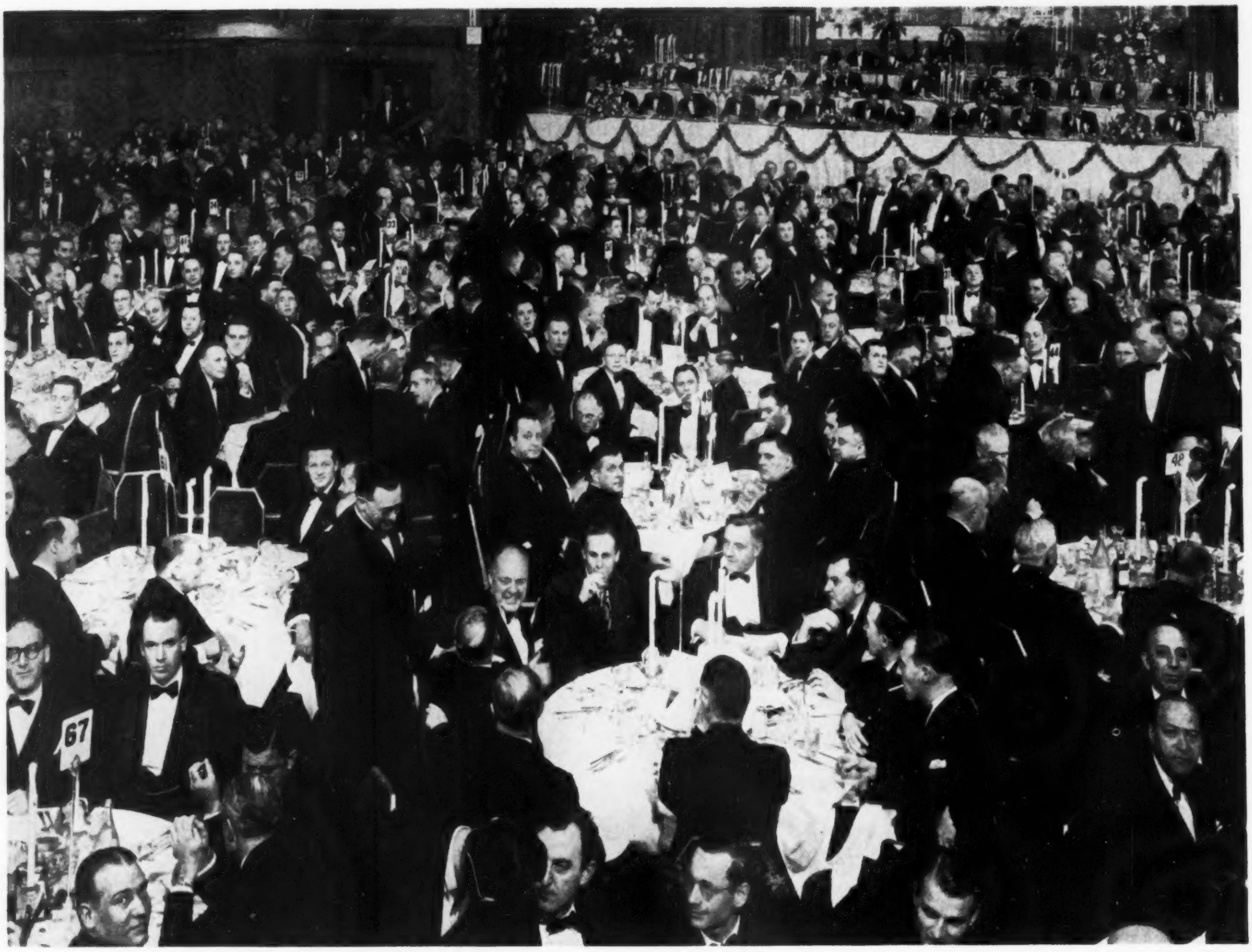
Tar acid extraction plant utilizes one of the Wilton Still "cuts".



Phenol Still where the crude tar acid oils are further distilled to give phenol and cresols for insecticide and herbicide production.



Sodium thiocyanate facilities to recover hydrogen cyanide from the coke oven gas and then convert it into sodium thiocyanate.



DCAT at the Waldorf-Astoria

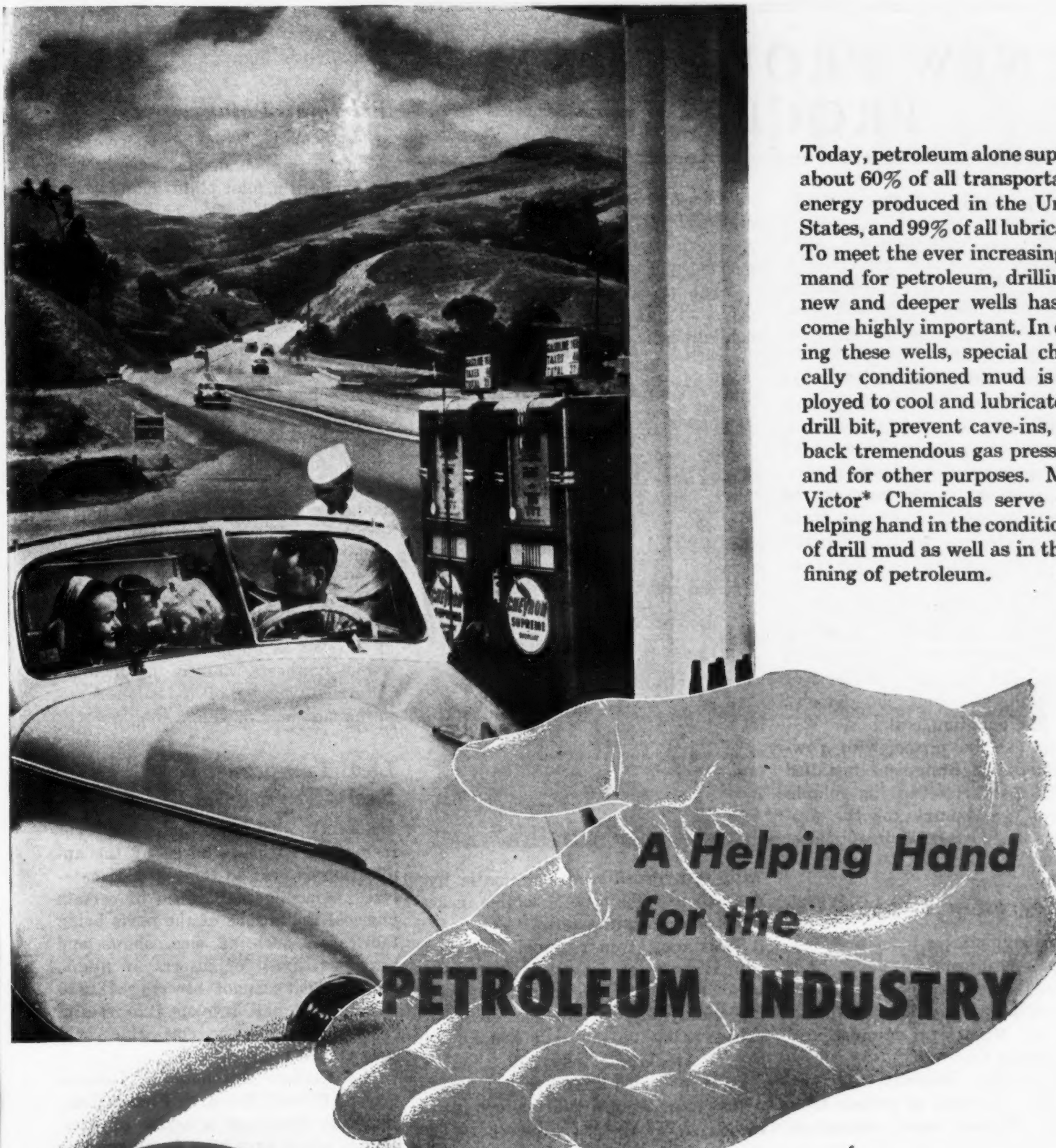
The twenty-second annual dinner of the Drug, Chemical and Allied Trades section of the New York Board of Trade, held March 11 at the Waldorf-Astoria Hotel, drew more than 2,150 members of the drug, chemical and related industries from all over the country. Principal speaker was Leland Stowe, foreign correspondent and author.

Sinclair Labs

Principal buildings for Sinclair Refining Company's new Research and Development Laboratory are rapidly approaching completion on the 38-acre site at Harvey, Illinois, which is being developed by the Austin Company, engineers and builders, under a four million dollar contract.

The "L"-shaped, three-story administration building beyond the parking lot, is connected to the "U"-shaped main laboratory building by a covered passage. The tall structure with lofty shafts of ventilating sash in the foreground will house six individual pilot plant units. Beyond this are a boiler house and shop; beyond them, compounding and lube testing laboratory (right), and catalyst activity laboratory (left).

Today, petroleum alone supplies about 60% of all transportation energy produced in the United States, and 99% of all lubricants. To meet the ever increasing demand for petroleum, drilling of new and deeper wells has become highly important. In drilling these wells, special chemically conditioned mud is employed to cool and lubricate the drill bit, prevent cave-ins, hold back tremendous gas pressures, and for other purposes. Many Victor* Chemicals serve as a helping hand in the conditioning of drill mud as well as in the refining of petroleum.



for 50 years VICTOR CHEMICALS *for everyday Living*

Victor chemicals used in oil well drilling and petroleum refining include:

Sodium Acid Pyrophosphate, Sodium Tripolyphosphate, and **Tetrasodium Pyrophosphate** . . . conditioning drill mud.

Alkyl Phosphates . . . oil additives, stabilizers for gasoline.

Ferrophosphorus . . . weighting drill mud.

Phosphoric Acid . . . refining oil and gasoline.

Tripotassium Phosphate . . . purifying gasoline.

*TRADE MARK

VICTOR CHEMICAL WORKS, 141 West Jackson Boulevard, Chicago 4, Illinois

NEW PRODUCTS & PROCESSES

New Technical DDT NP 638

A new-type technical-grade DDT which offers substantial economies to manufacturers of DDT agricultural and household dusts is now being produced by the Pennsylvania Salt Manufacturing Company.

Developed exclusively by Pennsalt, this new product is technical-grade DDT which can be made directly into finished dusts without the necessity of using 50 percent concentrates.

This important development in the DDT field, marketed under the trade name Pentech, is handled through Pennsalt's Agricultural Chemicals Division.

Use of Pentech instead of dust base 50% concentrates enables manufacturers not only to reduce production costs, but also to effect savings of approximately one-half in freight, storage and handling costs.

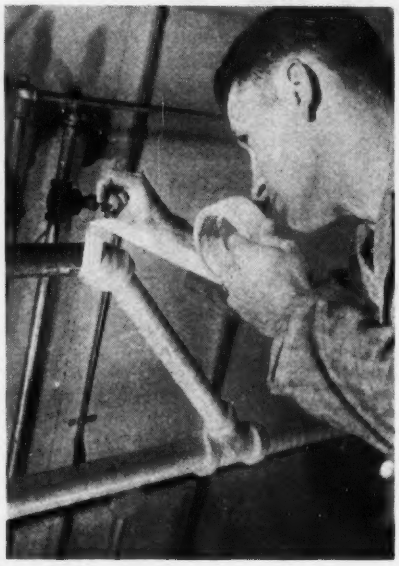
Pentech can be mixed with powdered diluents in equipment installed in many insecticide mixing plants throughout the country for the production of finished DDT insecticides.

Anti-Corrosion Tape NP 639

A new vinyl plastic pressure-sensitive tape—designed to have high stretch and exceptional corrosion resistance—is now being distributed nationally by Minnesota Mining and Manufacturing Co.

In the chemical industry, the tape is expected to be used to protect metal pipes, fittings and equipment against corrosive fumes and acids, to seal rubber tubing and desicators, and for temporary repairs. It is trademarked "Scotch" Plastic Film tape.

Tests reveal excellent resistance to acids, alkalies, water, salt water, alcohol, aliphatic hydrocarbons, and oils,



with fair resistance to aromatic hydrocarbons. The tape is soluble in ketones and certain esters.

The tape, given regional tests last fall, is provided in yellow, black and white films, with the yellow tape having additional resistances to enable it to meet the unique requirements of the electroplating industry.

It is provided in 36-yard lengths, with widths from a quarter-inch to 22 inches. Thickness is seven mils. Elongation at break is 175 percent, with stretch in the transverse direction slightly higher.

Ethylene Thiourea NP 640

Ethylene thiourea, a reactive heterocyclic compound, has recently been introduced in pilot plant quantities by the Rohm & Haas Co. This compound, also called 2-imidazolidinethione, has a melting point of 203-204°C., and is soluble in water to the extent of 2% at 30°C., 9% at 60°C., and 44% at 90°C. It is moderately soluble in methanol, ethanol, ethylene glycol, and pyridine, but insoluble in most other solvents.

The reactions of ethylene thiourea usually involve the tautomeric isothiourea form, and include alkylation preparation of 2-aminoimidazolines, oxidation to sulfides or sulfinic acid, formation of methylol derivatives, and acylation. Ethylene thiourea forms complexes with a large variety of metallic salts.

Ethylene thiourea is expected to be of interest as an intermediate for organic synthesis, and in applications taking advantage of its salt-forming properties with metals.

Low Temperature Resin Curing NP 641

Recently developed polyester type resins are normally cured by the application of heat to the peroxide catalyzed monomers. Because of certain physical limitations of the parts being fabricated, such as size, shape and heat sensitivity of inserts or fillers, applied heat cannot always be used and a need has developed for resin-catalyst-promoter systems which will cure at low temperatures.

The Cornell Aeronautical Laboratory of Cornell Research Foundations, Inc., has developed a series of compounds which have been found suitable for certain applications in this field. The laboratory has made some use of these compounds in its own experimental work and has filed patent applications covering the use of these compounds as polymerization accelerators or promoters.

Arrangements have been completed for the pilot plant manufacture of these compounds by Lucidol Division of Novadel-Agene Corp. The new products will be made available under the trade name "Plastiset."

Vinyl Base Adhesive NP 642

Plastics, wood, metal, rubber, leather, crockery, glass, mirrors and labels can be easily adhered to themselves or to each other on an efficient production line basis by a powerful vinyl

CHEMICAL INDUSTRIES TECHNICAL DATA SERVICE

CHEMICAL INDUSTRIES, 309 W. Jackson Blvd., Chicago 6, Ill. (4-8)

Please send me more information, if available, on the following items. I understand that nothing further may be available on some of them.

NP 638	NP 642	NP 647	NP 652
NP 639	NP 643	NP 648	NP 653
NP 640	NP 644	NP 649	NP 654
NP 641	NP 645	NP 650	NP 655
	NP 646	NP 651	NP 656

(Please print)

Name.................................. (Position)....................

Company..

Street..

City.............................. Zone.......... State..............

base cement, manufactured by Schwartz Chemical Co., Inc.

This all-purpose transparent water-white cement is easy to apply and does not affect the material it is applied to, mirrors and thin plastics included. Called REZ-N-GLUE, it is said to dry fast but not too fast for handling large pieces. The cold-setting adhesive requires only a one-surface application, has good wet "grab", remains permanently flexible and will not become brittle. It can easily be applied by brush, roller or spray and is resistant to water, oil, gasoline, vermin and mold. The manufacturer states it is completely non-staining and has excellent tensile strength. It is now available in gallon cans as well as in steel drums.

Emulsifying Agents NP 643

Planetary Chemical Company has announced the addition of four new members to its D-Spers-O series of emulsifying agents. These new surface-active agents are not sulfonated products. They are characterized by an unusual range of solubilities in organic solvents, each one having been developed for use with a specific class of solvents. Each of the new products possesses powerful emulsifying properties, even when employed at relatively low concentrations, as well as marked detersive action. They are clear, amber-colored, viscous liquids which are completely soluble in the recommended solvents.

D-Spers-O W is soluble in water and in many alcohols, ketones, and esters. It is recommended for use in aqueous solutions as an emulsifying and surface-active agent with excellent detersive properties. When employed with water-immiscible solvents, the resulting solutions may either become "solubilized" in water or will emulsify readily with water in any proportions.

D-Spers-O PS dissolves readily in petroleum solvents to yield perfectly clear solutions. Ten percent solutions in petroleum solvents are generally emulsifiable with water in all proportions to yield stable emulsions. The degree of stability of such emulsions can be regulated by varying the percentage employed. D-Spers-O PS should be of particular interest to formulators of insecticides and to manufacturers of dry-cleaning soaps and additives.

D-Spers-O MO is recommended for use in the preparation of mineral oil emulsions and "soluble oils". Approximately ten percent dissolved in mineral oil produces a clear oil which will produce stable emulsions with water in any proportion.

D-Spers-O Cl is designed for use

with chlorinated solvents. It is readily soluble in all common solvents of this type and the resultant clear solutions are easily emulsifiable. D-Spers-O Cl acts as an excellent dry-cleaning "soap" for use with chlorinated dry-cleaning solvents.

Paisley Introduces Novel Adhesive NP 644

A synthetic resin-latex emulsion cement has been produced by Paisley Products, Inc., Chicago, which has the ability to permanently adhere ungummed paper labels to a wide variety of surfaces and surface finishes. Designated No. 1707 by the makers, it is being offered for fastening instruction labels, circuit diagrams, caution and brand labels to electrolytic tin plate, terne plate, varnished, lacquered, painted and enameled surfaces. Typical field uses include labeling of refrigerators, household appliances.

Market New Synthetic Resin Coatings NP 645

Cheesman-Elliot Co., Inc., Brooklyn, is now marketing a line of new priming and finishing paints made with Resin A, a product of the Standard Oil Co. of N. J.

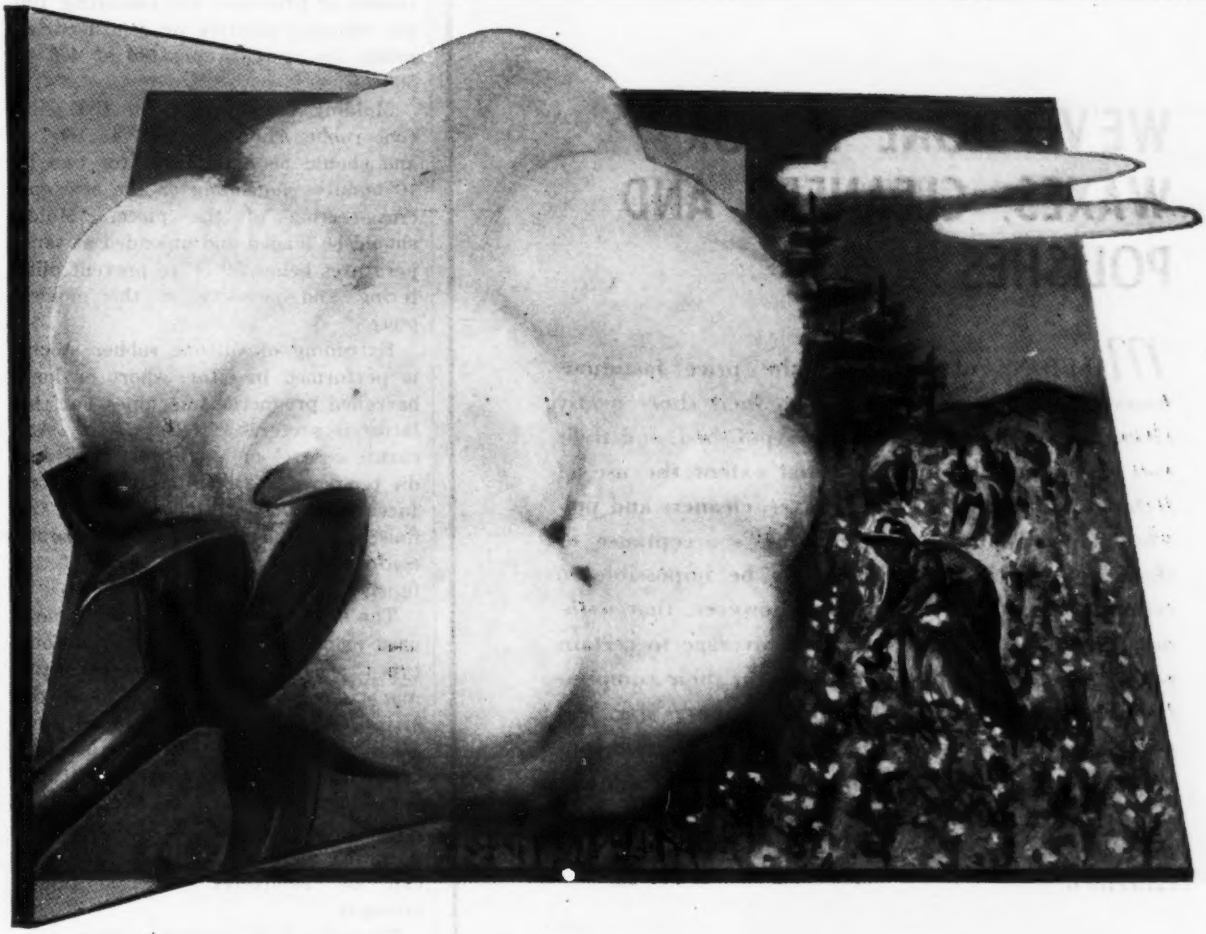
The paints are claimed to possess unusual properties as far as adhesion, and alkali and acid resistance are concerned.

Silicone Rubber NP 646

Seven standard grades of silicone rubber molding compounds are available from the Chemical Department of General Electric Co. All stocks withstand temperatures ranging from minus 70° to plus 520° F and have excellent electrical and chemical properties.

Stocks include both molding and extruding compounds which may be readily processed in customary production equipment. Grades No. 13000 to 13001 are extrusion stocks in white. Grade 13002 is a molding stock in white. Grades 13003, 13005, and 13006, are brown stocks for both extrusion and molding while Grade No. 13004 is white for both extrusion and molding.

The company recommends that the molding compound be premilled for about 10 minutes on cold rolls prior to molding to insure satisfactory flow and plasticity. Molding should be performed at low pressures in standard compression or transfer molds and the mold design should allow for about two to three per cent dimensional shrinkage on curing. Flash type molds give the most satisfactory



results at pressures not exceeding 100 psi whereas positive or semi-positive molds are usually operated at 400 to 500 psi.

Molding temperature for G-E silicone rubber should be 140° to 160° C and should be maintained for two to 10 minutes depending on the size and cross-section of the piece. Molds should be loaded and unloaded at temperatures below 50° C to prevent blistering and porosity in the molded piece.

Extruding of silicone rubber stocks is performed in either short or long barrelled production machines but the latter is preferable, G.E. stated. Accurate control of extrusion speed and die temperatures results in better surfaces and closer dimensions for the finished product. Die design should conform closely with the shape of the finished part.

The silicone rubber compounds, now used principally as gaskets in various types of industrial equipment, have many advantages including heat resistance, nonadherence to metal surfaces, good gasketing action because of low compression set and stability of surface hardness and resilience. The materials do not tend to cold flow nor vulcanize at room temperature. Stocks can be reinforced for additional strength.

Uses for G-E silicone rubber now include gaskets for high speed shafts, diesel, gasoline, jet and gas turbine engines, baking and drying ovens, high temperature lighting equipment, high vacuum systems, and capacitor bushings. The company recently announced a new silicone rubber adhesive which permits bonding of fully-cured rubber to itself and other surfaces.

Test for Seeds NP 647

VitaStain (2,3,5-Triphenyltetrazolium Chloride) is a versatile reagent for the determination of the germinability of seeds, for staining the cambium layer of living twigs, for staining yeasts, bacteria and a wide variety of other living tissue. This staining of living tissue is believed to be due to enzymatic reduction of the soluble colorless salt to an insoluble red dye, triphenyl formazan.

In general the viability of seeds is determined by soaking the sectioned seed in a 0.5 to 2% aqueous solution of VitaStain for 2 to 8 hours and examining the stained seed. At the end of this period the embryo will be stained red in such fashion that its component parts are readily distinguishable. Living portions of the embryo will be stained varying shades of red while non-living areas and the remainder of the seed will be unstained.

The property of staining living tis-

sue suggests many other applications of VitaStain in biological studies such as cancer research, enzyme studies, the preparation of specimens and slides for both research and instructional purposes.

Exposure of VitaStain to light results in the rapid development of a bright yellow color which does not interfere with its use as a tissue stain. This high degree of light sensitivity suggests the possible use of VitaStain as a photographic agent. VitaStain is made by Arapahoe Chemicals, Inc.

Coatings Give 20-Year Protection NP 648

Two new types of anti-corrosive Zincilate coatings, which will air-dry without baking, have been put on the market by Industrial Metal Protectives, Inc. Accelerated laboratory tests indicate that the products will give 20-year protection against corrosion.

These coatings are sufficiently flexible that sheets, pipes and forms can be bent double, after coating, without breaking the protective coating. Overcoatings of enamel, paint or Wrinkle finishes may be applied over Zincilate after five minutes of air drying, and both coatings baked at the same time.

Zincilate is adaptable to production line application by diping, spraying, brushing or roller coating, with conventional finishing equipment. It has been adopted by many manufacturers of air conditioning equipment, bakery equipment, automotive parts and assemblies, valves, sheets, pipe, screens and other products. It can also be used for maintenance and repair of existing structures.

Straw for Paper Products NP 649

A process for producing fine paper pulps from wheat straw, at lower chemical costs and in significantly higher yields than previously thought possible, has been developed by the Bureau of Agricultural and Industrial Chemistry, U. S. Department of Agriculture.

Ninety-five million tons of wheat straw were grown last year. The straw burned and wasted would have been sufficient to produce 20 million tons of cellulose pulp, this country's entire requirement.

The fact that straw has not been used in this country for making fine papers is due both to economic and technological limitations. The new process produces yields of 50 percent of screened, bleached pulp. This is 5 to 10 per cent higher than other processes operating on straw and most processes using wood. The cost of pro-

Basically, Davison Silica Gel possesses a unique combination of qualities—large surface area and high adsorptive capacity, good physical strength, and the chemical inertness of SiO_2.

If your manufacturing, packaging or other processes require any of the silica gel properties in the adjoining list, you are invited to consult Davison.

THE DAVISON CHEMICAL CORPORATION

Progress through Chemistry

BALTIMORE-3, MD.

SOME GENERAL PROPERTIES OF SILICA GEL AND HOW THEY ARE UTILIZED

•

DEHYDRATION

Silica gel will adsorb water from gases, liquids or solids, in quantities up to 40% of its own weight. This property has been widely utilized for dehydrated packaging, conditioning of process gases and liquids, and other adsorptive drying applications.

SELECTIVE ADSORPTION

Definite relationships exist between silica gel and adsorbates. Determination of these relationships in connection with your problem may provide a practical answer. Silica gel has been found satisfactory for the separation of complex compounds in the petroleum, pharmaceutical and refrigeration industries.

CATALYTIC

The advantages of large surface area, specificity, physical strength, and product uniformity have made silica gel a desirable catalyst or catalyst support in fluid or fixed bed operations. Petroleum cracking, oxidation and alkylation catalysts based on silica gel are in commercial use.

. . . AND MANY MORE

The above can only be a partial list of the properties and the many applications of silica gel. More are yet to be developed through Davison's program of Progress through Chemistry.

curing clean straw has been a stumbling block in the past. Members of the strawboard industry and manufacturers of farm equipment have met at the Peoria Laboratory to perfect better methods and means for securing clean dry straw at lower costs.

The properties of this pulp seem unique; the pulp tests better in physical properties than soda pulps from any of the hard woods and is the equal, excepting in tearing strength, of soft wood sulfite pulps. The pulp is excellent for producing well formed papers, and hydrates easily. It is believed that this fine pulp should find its logical use as a blend with any of several different kinds of wood pulp to produce fine papers, such as magazine, book, writing, litho, off-set, certain grades of waxing tag, bristol, and other specialties.

The process is now ready for mill-scale trials. The technological soundness of this process is demonstrated by the fact that Dutch paper engineers, to whom this process was suggested, are using it successfully on a commercial scale in Holland, where straw is the main raw material for paper.

Die Lubricant for Brass Forging NP 650

A lubricant and an application method for press forging brass have been developed by Acheson Colloids Corp.

Advantages include better parting, cleaner and sharper forgings, improved surface finish and longer die life. In addition to these advantages one brass plant is effecting a saving of approximately $9,000 a year in lubricant cost.

Intricate shapes are formed in perfect detail. For example, using conventional type lubricants one brass object having gear teeth resulted in rounded corners on the teeth. By using the special lubricant all corners of the teeth were sharp indicating free flow of the metal to all parts of the die.

The lubricant itself is a special dispersion of semi-colloidal graphite supplied in concentrated form that is added to another fluid.

Liquid Adhesives NP 651

Two new modified phenolic liquid adhesives designed for cementing metals, thermosetting plastics, wood, fabric or any combination of these have been developed by the General Electric Chemical Department.

Designated as G-E adhesives Nos. 12507 and 12508, the new bonding agents when properly cured, exhibit high shear and tensile strength and

exceptional resistance to water, gasoline, kerosene and mineral oils. The adhesives are especially useful for cementing metals and laminates, for preparing metal faced, sandwich-type construction, for attaching brackets and lugs to thin metal sheets, and for the light vehicular construction found in trailer walls, airplane fuselage walls, and the walls of prefabricated housing. The use of these adhesives eliminates the necessity for sanding plastics.

Especially recommended for thermosetting plastics because of its superior flow characteristics, G-E adhesive No. 12507 has exceptionally high solvent resistance. It is designed for applications which require an effective adhesive with a high shear strength where facilities are available for pre-baking the adhesive film before pressing.

G-E adhesive No. 12508 is recommended for applications in which the adhesive must possess exceptionally high cleavage strength and in which higher application pressures are available for assembly.

Protective Coating NP 652

Metal, wood, leather and fabric surfaces can be protected from corrosion and deterioration by a new transparent liquid skin manufactured by State Chemical Corp.

Called Permacote, the protective coating has been designed for use on surfaces which require protection from moisture, acids, alkalis, alcohol, dyes, dirt and dust. It can easily be applied by brush, spray or dip and forms a tough transparent coating which remains flexible. The new product is also resistant to extremes of heat or cold and will not crack or chip in spite of the expansion or contraction of the surface it protects. The coating imparts a lustre to any surface it is applied to and effectively seals in and prolongs the life of ordinary paints, lacquers and varnishes. It is available in one and five gallon cans as well as in 50 gallon steel drums.

Asphalt Aid NP 653

Experiments described by the Atlantic Refining Co. have shown how to make asphalt cling to the stone of a roadbed even in periods of heavy rain, thus averting premature disintegration of the pavement. Speedier construction of asphalt roads and streets also will result from the investigation, since the frequent delays now caused by unfavorable weather will be largely eliminated.

Closer adhesion of asphalt to stone can be assured by adding to the asphalt small amounts of substances

known as bonding or anti-stripping agents, which improve its spreading power and water resistance.

The general procedure followed in the tests, was to apply a liquefied asphalt, with and without bonding agents, to various types of stone. The completely coated stone was allowed to cure for forty-eight hours at 110 degrees F., and then immersed in a watery solution of known acidity for twenty-four hours at 77 degrees.

Noting that the decisive factor in controlling asphalt coating retention on stone is the acidity of the aqueous solutions involved, it was found that: Improvement in adhesion is associated with a decrease in the interfacial tension of asphalt-aqueous systems. Increasing the concentration of a non-stripping substance in asphalt without exception effects a decrease in interfacial tension between the asphalt and a water solution of any given acidity.

Results of this work show that the amount of stripping at any acidity varies with mineralogical composition of the stone, the tendency to strip from a basic type stone such as limestone being considerably less than from an acidic stone such as rhyolite.

Factors studied were the acidity of aqueous solutions, the mineralogical composition of the stone, the chemical nature of the bonding substance in the asphalt, and interfacial tension characteristics of the asphalt-aqueous systems.

Elaborating on the experiments, it was reported that acid solutions favored the retention of asphalt on the acidic stone, while, with basic stone, the opposite was true.

Heat Resisting Aluminum Paint NP 654

Heatrem, a new high-heat resisting aluminum paint has been developed by Speco, Inc. It is made specifically for use on exterior and interior metal surfaces where temperatures reach 1500° F. or any wood, brick or concrete surfaces exposed to extreme heat.

Heatrem fuses with metal surfaces to form a permanently bright, elastic finish that resists moisture, corrosion, acids, alkalis and industrial fumes.

It is reputed to set up in 4 hours and dry completely overnight, before soot, oil or grease deposits can affect maximum brilliancy.

The manufacturer recommends Heatrem for painting boilers, furnaces, condensers, compressors, ovens, stacks, engines, steam lines, exhaust manifolds and all metal surfaces where heat ranges between 1000° F. and 1500° F.

Heatrem is packaged in 5 gal., 1 gal., 1 qt., pint and half pint cans.

Wax From Mexico NP 655

An annual source of 10 million pounds of new industrial wax from Mexico's Yucatan peninsula has been reported by the International Division of Armour Research Foundation of Illinois Institute of Technology.

The new wax, which has properties similar to those of carnauba, is obtained by a solvent extraction process from the bagasse or waste pulp remaining after decortication of henequen or sisal fiber.

This wax is hard, has a melting point of 85° C, and bleaches readily to an almost colorless material for industrial finishes and coatings. Complete studies of its properties, many of which will appear in forthcoming reports, are continuing in the Mexican laboratories of the Foundation.

Odorless Dry-Cleaning Solvent NP 656

Especially suitable for dry-cleaning of clothes and other textile products, a new and relatively odorless solvent, designated temporarily as "PD942A," has been developed by the Socony-Vacuum Oil Company, Inc. It practically eliminates the time needed for deodorization.

Also, according to Socony-Vacuum, "PD942A" is unchanged by redistillation or filtration. Where "PD942A" is used exclusively in dry-cleaning establishments, the risk of garments reabsorbing shop odors is eliminated.

Socony-Vacuum's new solvent was described by company officials as free of aromatic, naphthenic and unsaturated hydrocarbons which normally account for odors in solvents. It is a byproduct of petroleum operations developed during the wartime aviation gasoline program.

The relative odorlessness of "PD-942A" results from the refining process, rather than from subsequent addition of chemicals such as masking agents. Although there is an almost imperceptible bland odor in this newly-developed hydrocarbon compound, it bears no resemblance to the odor of conventional naphtha.

A virtue of interior paints produced with "PD942A," it was said, is the fact that rooms in corridors in public buildings, such as hospitals, hotels and department stores, can be used as soon as the paint dries, eliminating the usual waiting period until all paint odors are dissipated. It is adaptable to gloss, semi-gloss and flat paints where low residual odor is desirable.

Another potentially extensive use for "PD942A", Socony-Vacuum disclosed, is in the formulation of paste waxes, polishes and creams, where it yields more uniform and economical applications with easier buffing.

NEW EQUIPMENT

Flow Rate Indicator QB 467

For reproducing desired rates of flow in liquids, with a high degree of accuracy, the K & K Engineering Co. has developed the Stroboflow. It comprises a precision-made turbine, mounted on stainless steel pivots in Graphitar bearings between trans-

parent panes, and allowed to rotate, practically floating in synchronism with the liquid.

The rotational speed of the turbine is a measure of the quantity of liquid flowing. Since there is a straight-line relationship between the speed of the rotor and the quantity of the liquid, and since the Stroboflow provides a precise means of determining rotor speed, these two factors are combined and constitute an accurate method of flow-rate indication.

The rotor's speed is determined from the stroboscopic effect of light viewed through an aperture in the turbine disc. The number of virtual images so obtained is a measure of the rotational speed, which in turn is directly proportional to rate of flow. The stroboscope is calibrated in terms of stationary patterns of these images. Once a predetermined pattern is established, indicating a desired rate of flow, any deviation however minute from this rate of flow, will cause the pattern to precess.

The direction of precession, clockwise or counter-clockwise, is an indication of decreased or increased flow rate. The amount of precession is a measure of loss or gain in amount of liquid delivered. By noting the amount and direction of precession and then adjusting the rate of flow to return the pattern to its original position, the operator is able to re-establish the actual desired volume of liquid per unit time.

The Stroboflow is uniquely useful for calorimetry where it is necessary to know the exact quantity of liquid absorbing heat.

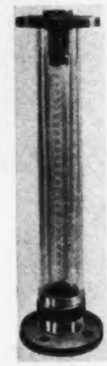
The Stroboflow will simplify measurements of pump capacity and contribute to simplification of many other hydraulic control problems, such as the measurement of fuel consumption in combustion processes.

Chemical Service Rotameter QB 468

The new chemical service rotameter of Schutte and Koerting Co. is rigid, self supporting in a pipeline and does not require expensive end fittings. Also, the need for stuffing boxes has been eliminated.

The new design is made possible through the use of a recently developed Corning glass flange on the rotameter tube. It may be connected directly to a standard four hole flange —or with a companion flange it may be connected to a threaded pipe. Where required, a very thin neoprene gasket is provided. For special applications, this gasket may be supplied in Teflon.

In standard models the rotor stop is hard rubber and the rotor is stainless



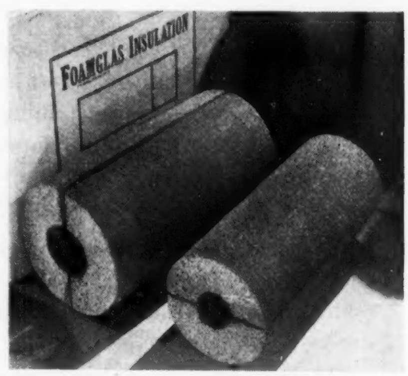
steel. On special order, the rotor stop may be made of Pyrex glass or Teflon.

An integrally built Lucite tube covers and protects the measuirng tube. The Lucite tube is fitted with a metal adjusting ring which permits the tube to be held rigidly in position by forcing it against cast iron flanges at each end of the rotameter. At the same time it holds the flanges in position for tightening against companion flanges in the pipeline.

This rotameter is available in sizes from ¼" to 4".

Foamglas Pipe Insulation QB 469

The first pipe insulation for both hot and cold lines, indoors and outdoors, is the new Foamglas insulation of the Pittsburgh Corning Corp. The new insulation is of cellular glass construction. The new product is un-



affected by humidity, is highly resistant to fumes, vapors, and acid atmospheres.

An outstanding quality is its resistance to fire. It is non-combustible and acts as a fire retardant. In addition, it is waterproof and vaporproof. The composition is strong, rigid, light in weight, and easy to cut and fit with ordinary tools.

The insulation comes in two equal


BEMIS MINUTE MOVIES
FOR SHIPPERS WHO WANT TO SAVE TIME AND MONEY
★ ★ ★
CEDRIC,
THE CHEMICAL THAT WALKED IN HIS SLEEP
1. Cedric is a strange chemical . . . has the jitters . . . is hard to control.
ZZZ
2. Formerly he sifted about in storage . . . went sleep-walking and wasted his strength.
ZZZ
3. He needed better packaging . . . got it in a Bemis Waterproof Bag. Now he sleeps like a baby through long days and nights in storage.
USE BEMIS WATERPROOF BAGS
4. And Cedric's rarin' to go when it's time for work.
Some chemicals sift out of ordinary containers and cause additional loss by damaging products nearby. They need the protection of Bemis Waterproof Laminated Textile Bags. These bags are extra sturdy . . . they resist tears and punctures. They are fully tested *before* they're put to work. *These pre-tests stop protests* . . . assure complete satisfaction.
Guard your products during shipment and keep them safe in storage with Bemis Waterproof Bags. Mail coupon now for prices and complete information.
BEMIS BRO. BAG CO.
Waterproof Department
Nation-wide Production and Sales
BEMIS Waterproof BAGS
BEMIS BRO. BAG CO.
408-J Pine Street, St. Louis 2, Missouri
Send details about Bemis Waterproof Bags for
(Product)
Name
Company
Street
City
Zone
State

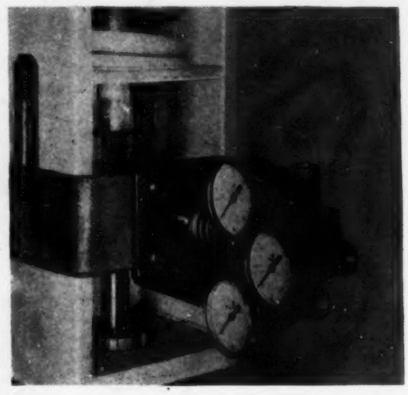
half-sections, 18 inches long, and is being manufactured for all sizes of pipe.

When installed according to the manufacturers specifications, the new Foamglas pipe-insulation may be used through temperature ranges from —200° F. to +800° F.

Foamglas is impervious to water and water vapor. By virtue of this property Foamglas has the same thermal conductivity, whether wet or dry, and will maintain its original low rate of heat transfer permanently—regardless of exposure—and without expensive weather proofing or other protective coverings.

Valve Positioner QB 470

A cam-operated positioner is a key feature of a new diaphragm motor valve of the disc or butterfly type which is now available from R-S Products Corp. Excellent control of



flow characteristics is attainable by changing cams in the field on the cam-operated positioner, which, in effect, adds to the normal functions of the disc type valve. The desirable characteristics of a straight line, semi-log curve (V-part), ratio plug valve, throttle plug valve, linear, or almost any other desired special characteristics, are within the range of the new positioner.

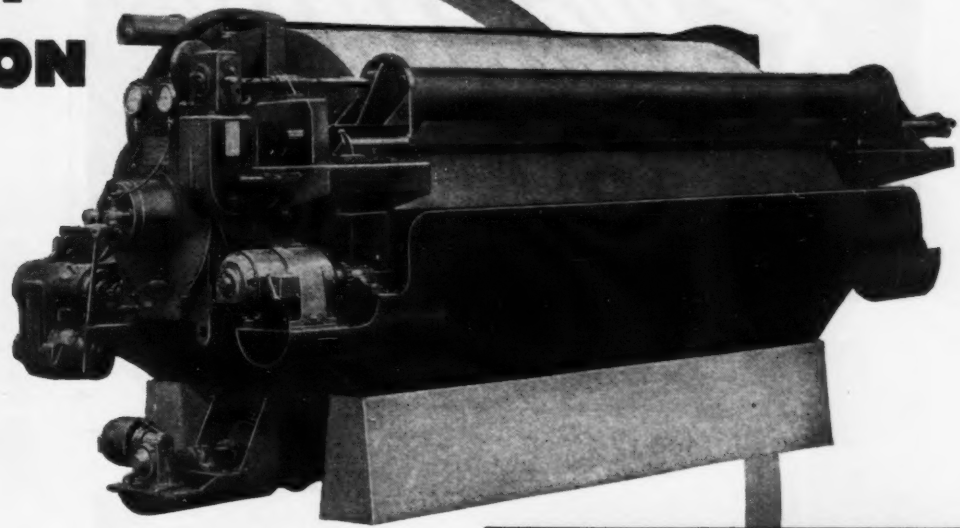
Replacing of one cam on the positioner with another of a different shape permits the retention of the basic advantages of the disc type valve while adding special flow characteristics typical of other valve types.

Electronic Relay QB 471

R-S Products Corp. has made the new Leveltronic relay available. In operating the Leveltronic control relay, the circuit is of the positive acting thyratron type with the tube current limited to less than ⅓ its maximum value, resulting in long, trouble-free life and low maintenance. Two models cover a range of 20 ohms to

OLIVER "PRECOAT" FILTRATION

Often the Best for "Hard-to-Filter" Solutions



*Solutions with Sticky Solids

*Solutions with Small Amounts of Solids

*Solutions requiring High Polish

We're talking now about continuous vacuum filtration in contrast to batch pressure filtration which, until recently, had to be used on all such solutions. Today, the story is different. Today, by means of the Oliver Precoat Filter, continuous vacuum filtration can be used on most "difficult-to-filter" solutions... and to great advantage.

If you are handling such solutions on batch pressure filters with their attendant heavy manual handling and general messiness, investigate the Oliver Precoat Filter and its possibilities for helping to reduce your filtering costs.

The way the Precoat Filter works is briefly this: first a thick cake of a pervious filter medium or precoat is built up on the drum (taking an hour or two); then the solution to be filtered is fed into the tank or vat while keeping the drum rotating and the vacuum on. The thin film of solids forming on the surface is shaved off continuously, always leaving a fresh surface of precoat for further cake deposition. In this way the cake never gets thick enough to retard or stop the flow of filtrate. That's why the Oliver Precoat can handle those "difficult-to-filter" solutions. Actual filtering cycles last from several days to several weeks continuous operation, depending upon how much precoat has to be removed each revolution.

OLIVER UNITED FILTERS INC.

UF INC.

New York 18, N. Y.
33 West 42nd Street

San Francisco 11,
California

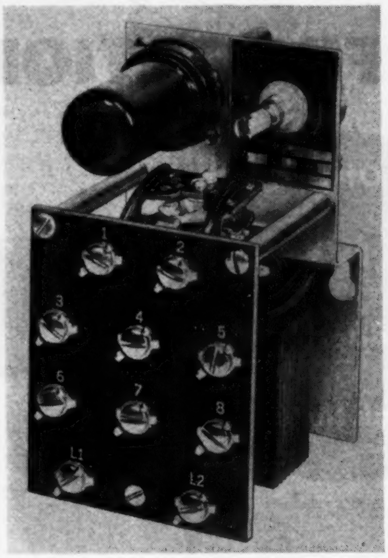
Chicago 1, Ill.
221 N. LaSalle Street

Western Sales Division
Oakland 1, California
2900 Glascock Street

Sales and Manufacturing Representative:
E. Long Limited
Orillia, Canada

Factories: Oakland, Calif. • Hazleton, Pa. • Orillia, Canada • Melbourne, Australia

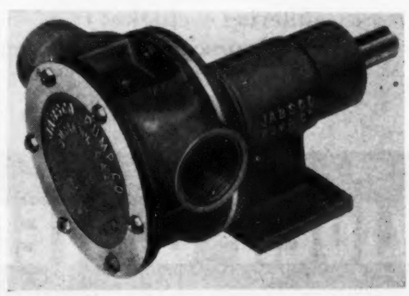
above 2 megohms with continuously variable sensitivity giving 2 to 1 discrimination over the full range. The circuit is stable over a wide range of voltage fluctations. The relay has



double pole, double throw action with heavy contacts capable of actuating up to a ½ horsepower motor. Direct and reverse acting units are available. Construction is in accordance with NEMA standards, with the low-voltage (6 volts) control circuit completely isolated from the line. The actuating circuit energy is approximately 1 billionth of a horsepower, causing no appreciable heating, arcing, ionization or chemical change.

Pump QB 472

The new pump of the Jabsco Pump Co. is of stainless steel (18-8 Mo., Type 317) and intended primarily for use in chemical and rubber applications. It is larger than earlier models



and although both operate with a flexible impeller the latest model has an impeller shaft more accessible for ready cleaning or replacement. Removal of six nuts, securing the cover plate, is all that is required. "O" ring type gaskets are used.

The impeller on the new model is symmetrical and its direction of rotation can readily be reversed to counteract the tendency of the flexible impeller blades to take a permanent set when operating at relatively high

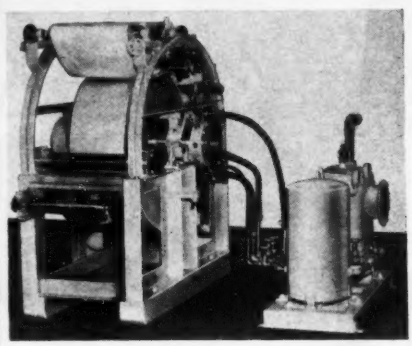
pressures. Rework was required for reversal in the older models.

The new pump is for connection to 1½" piping instead of 1" piping and weighs about 22½ pounds.

The pump primes automatically, operating suction being in excess of 27" of mercury. The liquid pumped provides automatic lubrication between the pump body and the impeller. Positive action mechanical seal is provided. Bearings are factory lubricated and sealed, and are protected by ample drain holes and slinger ring. An unusually wide range of satisfactory operating speeds, from 100 to 1750 RPM offers a maximum of flexibility.

Pilot Plant Rotary Vacuum Filter QB 473

A new rental-purchase plan has just been announced by Filtration Engineers, Inc., for pilot plant work



where it is not desired to tie up capital by outright purchase.

This plan is revealed coincident with the introduction of a new Feinc pilot plant rotary vacuum filter with the Feinc string discharge and washing mechanisms.

Under the plan, the pilot plant filter is placed with the customer on a monthly rental basis. The fee for the first month is set low to allow for time lost in starting up the process.

If a customer later purchases a larger filter for full scale production, or decides to purchase the pilot plant filter, a credit allowance based on the number of months the small filter is rented is issued.

The new filter has 3 ft. drum dia. and 1 ft. drum width (approx. 10 sq. ft. drum area). It is made of 316 stainless steel.

Glass Fabric Conveyor Belt QB 474

A hot material conveyor belt using glass fabric instead of the conventional cotton fabric has been developed by The B. F. Goodrich Co.

The company supplies two weights, a four-ply for light service and a five-ply for wider, longer belts where

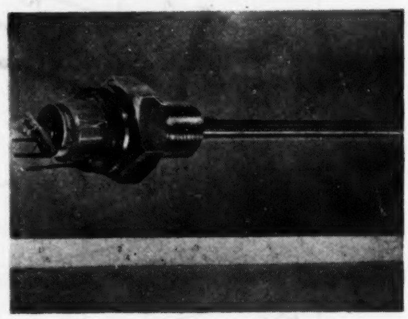
working stresses will be somewhat higher. Covers recommended are either a $\frac{5}{32}$ inch top and $\frac{1}{32}$ inch back or a $\frac{3}{16}$ top and $\frac{1}{32}$ back, depending on operating conditions.

Included in the belt's top cover will be a ply of longitudinal nylon breaker which to give best protection is floated $\frac{1}{32}$ inch above the carcass. The tensile strength of each ply of glass fabric is approximately equal to the standard 32 ounce cotton fabric used in conventional belts.

In one test, a glass fabric belt carrying hot lime ranging in temperatures from 300 to 450° F. was in service a year before removal for inspection, while the best record accomplished by a conventional cotton fabric belt on this conveyor had been seven months.

Temperature Transducer QB 475

The new Giannini temperature transducer is designed for telemetering applications where space is at a



premium. The instrument is only 1" in diameter.

A temperature-sensitive bi-metallic element, encased in a small tube, rotates a standard microtorque potentiometer. Any change of position of the bi-metallic element due to the slightest temperature variations, results in large voltage outputs from the microtorque potentiometer. The voltage outputs are of a large magnitude suitable for recording with oscillographs, galvanometer-recorders, and telemetering systems.

The standard resistance for the instrument is 5000 ohms, but resistances are available from 100 to 20,000 ohms. Designed for a temperature range from — 65° C. to + 150° C., the type 4911 temperature transducer has a linearity of 1%, an accuracy of 1%, and a sensitivity of 1° C. or less. This transducer has a standard response time of 2 seconds for a 5° change in temperature. The size, weight, and voltage output make this an ideal instrument for the transmission of compartment temperatures, liquid temperatures, ambient air temperatures, etc.

Long ago

. . . buying valves was simply a question of "*how many?*"

Long ago, when valve making was in its infancy, all valves were pretty much alike. So no one worried about what *kind* of valves to buy. But because industrial flow control requirements were equally simple, almost everyone was fairly well satisfied.

But not everyone! Because Powell, not content to "let well enough alone," introduced the first regrinding globe valve in 1865 ... and ever since then Powell has been producing "firsts."

And so today, to satisfy the many diverse and complex flow control requirements of modern industry, Powell makes a Complete Line of valves—not only in Bronze, Iron, and Steel, but also in the widest range of corrosion-resistant metals and alloys ever used in making valves.

As a result, there's still no need to worry about what kind of valves to buy—merely consult Powell Engineering.

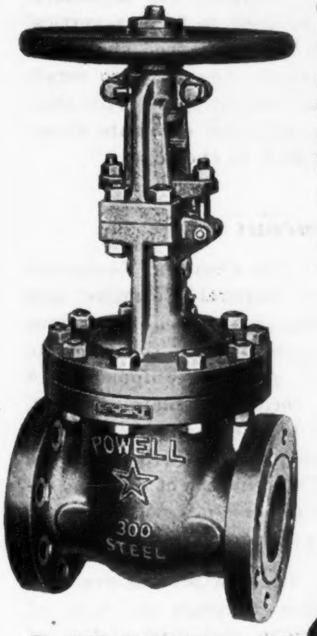


Fig. 3003—Class 300-pound Cast Steel Gate Valve with bolted flanged yoke, outside screw rising stem and taper wedge solid disc.

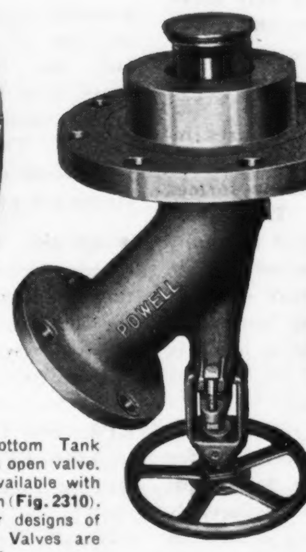


Fig. 2309 — Small Flush Bottom Tank Valve. Disc rises into tank to open valve. Sizes ¾" to 3", incl. Also available with disc lowering into valve to open (**Fig. 2310**). Sizes ½" to 3", incl. Other designs of Powell Flush Bottom Tank Valves are available in sizes 4" to 8", incl.

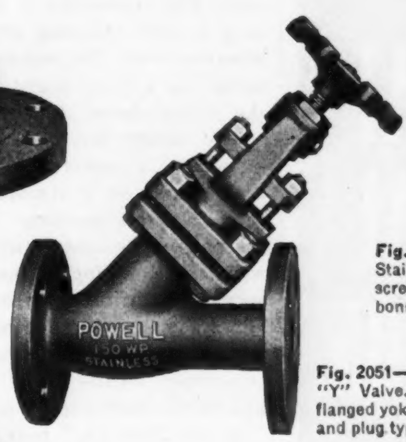


Fig. 2051—150-pound Stainless Steel "Y" Valve. Has flanged ends, bolted flanged yoke, outside screw rising stem and plug type disc.

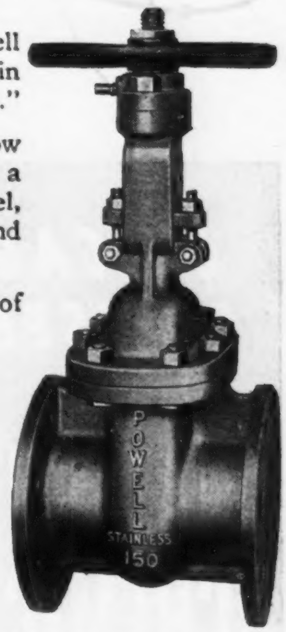


Fig. 2453-G—New, standard 150-pound Stainless Steel Gate Valve with outside screw rising stem, bolted flanged yoke-bonnet and taper wedge solid disc.

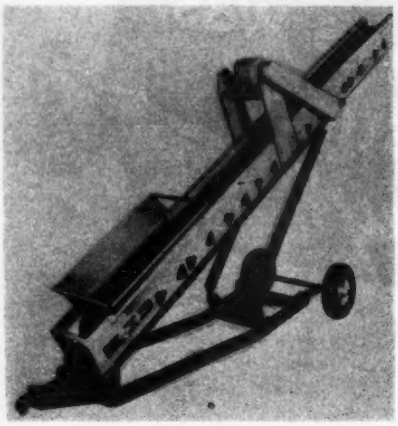
The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

Portable Conveyor QB 476

The new 14′ and 20′ portable conveyors of the Sermat Conveyor Corp., are powered by gas engine or electric motor. The conveyors have a tough



rubber ply canvas construction belt and are designed for handling all bulk materials.

It offers a hydraulic lift for raising the Serva-Belt to any position from level to 37. For complete portability it is equipped with 4.00″ x 8″ pneumatic tires.

Steam Couplings QB 477

Adjustment of packing while under pressure, and quick connection or disconnection, are two distinctive features of the new Hansen steam system coupling. Another is the smooth, unrestricted bore. Two different types of couplings, one for low, and one for high pressures, carry steam up to 350 psig. For connection it is only necessary to push the plug into the socket, where it locks. Its release can be obtained by a very slight movement of the socket sleeve.

The design for high pressures incorporates a socket and nipple to act as a gland on a replaceable formed type of steam packing. Take-up on the packing is accomplished manually with the coupling connected and in service. The high pressure coupling handles pressures ranging from 40 to 350 psig (saturated), and is made in two sizes—Series 2500 ($\frac{5}{16}$″ bore) and Series 4500 ($\frac{1}{2}$″ bore).

Series 2000 ($\frac{1}{4}$″ bore) and Series 4000 ($\frac{1}{2}$″ bore) are designed for steam pressures from 0 to 40 psi gauge (saturated). A replaceable steam washer type packing is used, on which wear is automatically taken up by spring pressure.

Preformed graphite and asbestos packings are easily replaceable in both types. Thread sizes range from $\frac{1}{8}$″ to $\frac{5}{8}$″. Series 4000 and 4500 are made with $\frac{1}{2}$″ pipe threads only. All machined parts are made from solid brass barstock.

Adjustable Conveyor Belt Troughing Idler QB 478

The new adjustable troughing idler of Koppers Company, Inc., has the outer inclined pulleys adjustable from slightly above the horizontal up to an angle of 25 degrees. All idler pulleys are located in the same vertical plane. The adjustment of the outer pulleys maintains a constant but minimum gap between the ends of the horizontal and inclined pulleys. This minimum eliminates any possibility of the belt being damaged due to creasing or pinching at such points.

This adjustable idler design is ideally suited for conveyors where any inclined belt changes to a horizontal path. At present this change in belt direction is accomplished by use of a flat bend pulley, or by a number of 20° troughed idlers in a vertical curve. Spillage often occurs when a conveyor belt flattens out while passing over a bend pulley. When standard 20° troughed idlers are used on a vertical curve, the conveyor belt is unduly stretched at the edges due to the deep trough. The adjustable idlers can be used to form a vertical curve and provide the shallowest depth of trough necessary to retain the material without spill. This shallow trough will also eliminate excessive belt stretch at the edges.

Miscellaneous

• QB 479 The Chemical Equipment Division of General Ceramics and Steatite Corp. has added impervious *graphite corrosion proof equipment* to its line of process equipment. A full line, including plate heaters, seven tube heat exchangers, bayonet heaters, and pipe and fittings will be carried. This equipment will be offered alone or combined with chemical stoneware and porcelain apparatus.

• QB 480 The new Metron *precision tachometer* is accurate to $\frac{1}{4}$% of the speed being measured and is of the continuous indicating type, covering wide speed ranges.

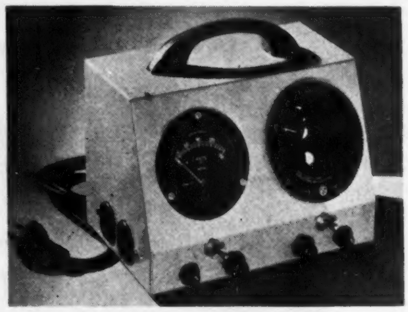
Two types are available: Type 48H, for speeds of 900 to 10,000 RPM; and Type 48J, for speeds of 90 to 1,000 RPM. Each has ten overlapping ranges, selected by a rotary switch. No damage is incurred by accidental selection of the wrong range.

Metron precision tachometers employ an electrical bridge circuit principle, and are self-calibrating. When calibrating, the sensitive speed measuring circuit is matched against internal precision resistors, insuring readings against changing ambient conditions.

These high-accuracy tachometers

can be used with Metron Type 46 high and low-speed adapters to shift measuring ranges up or down from normal ranges The tachometer head employs only one rotating part, permanently lubricated for long, trouble-free life.

● QB481 Andrew Technical Service, has developed a new *voltage control unit* measuring only 9" x 8" x 7" high, containing a 405 watt variable autotransformer and a 0-150 voltmeter,



for accurate control of output voltages.

The input rating is 115 volts, 50-60 cycles, single phase. Output is variable from 0 to 135 volts. Maximum current capacity is 3.0 amperes. Four plug-in load receptacles eliminate the need for tedious wiring jobs which would ordinarily be necessary in improving a hook-up of variable auto transformer, voltmeter and load.

● QB482 The new *flexible hose attachment* for all safety cans of ½ gal. or larger capacity manufactured by the Justrite Mfg. Co. is designed to facilitate the pouring of flammable liquids.

The hose attachment, Model No. 1088, consists of a 9½" flexible metal hose, a brass cup, and a removable strainer. A steel bracket holds the unit firmly attached to the can. When attached, the hose is flexible enough to be turned to any position, but is also rigid enough to remain in that position.

● QB483 The Yale & Towne Mfg. Co. is now producing a new line of low-cost, low capacity, *wire rope hoists*. Known as the "Load King" it will be available in ¼, ½ and 1-ton capacities. The frame of the portable hoist is a heavy, one-piece, ribbed-steel casting, constructed for use with lug, plain trolley, motor trolley, or winch-type mounting.

The quick-lifting hoist is equipped with a large-diameter drum with machine-cut grooves for guiding the cable as it winds. The drum has sufficient capacity to provide for full standard lift without overlapping of cable. The specially-designed reversing-type motor is rated to operate under constant service with full load without destructive overheating.

PACKAGING & SHIPPING

by T. PAT CALLAHAN

Improper Loading Damages Packages

THE SHIPPING Container Institute, 475 Fifth Avenue, New York 17, N. Y. has embarked upon a series of picture stories to graphically illustrate the faulty loading practices which were found to be the prime factors making for the current high rate of damage to packaged freight, as revealed by the Shipping Container Institute's study. The first and second series of pictures are reproduced in part here, for we feel that this is a very worthwhile undertaking and will contribute a great deal to all concerned in the elimination of the hazards connected with poor packaging, poor loading, poor bracing, and poor shipping.

The latest series of documentary photographs, taken by the Institute as part of its nation-wide study of the causes and responsibility for shipping damage, reveals the severity of the damage which is caused by the failure of shippers to block the doorways of freight cars.

These photographs were taken in some of the 700 freight cars which have formed part of the Shipping Container Institute's study of the life-cycle of over 860,000 fiber shipping containers.

When the few inches of extra width at the doorways of a freight car are not blocked, the load will tend to shift into this empty space during the jolting trip. Then, when the heavy doors are slid open, the containers pressed against the doors will be ripped open by the projections on the door. This is what happened to the containers of grapefruit juice shown in Figure 2 the same containers that were photographed some minutes earlier in Figure 1. Note how not only the fiber shipping containers but even the metal cans they carried were damaged by the heavy sliding door.

To prevent containers from slipping into this dangerous free space, doorways should be blocked. This is best accomplished by constructing a wooden framework having horizontal or vertical cross members spaced closer than the corresponding dimensions of the boxes and which will fit into the recess to take up the space. It may also be done by nailing boards or steel straps from wall to wall across the opening. It is very important, however, that such steel straps be correctly spaced in order to prevent containers from slipping between the straps and being crushed by the sliding door. Care should also be taken to see that the boxes are protected from contact with the ends of such boards or straps by means of sheets of corrugated fibreboard. This is particularly important in the case of metal straps with sharp ends; they should be bent back under before nailing to prevent them from tearing and cutting the shipping containers.

An exemplary instance of strong, safe blocking of doorways is provided by a shipper using bags, whose carload is shown in Figure 3. The sturdy wooden blocking has been lined with heavy paper to prevent the wooden edges from tearing the paper bags.

The S.C.I. study has revealed that some damage can be directly traced to the carriers, while other damage is controllable by the shippers. Figure 4 illustrates a type of damage due to interior conditions of freight cars which is under the control of shippers. A case has been ripped open by a protruding nailhead left in the wall of the freight car from previous use and not removed before loading. This

Figure 1—Containers in this freight car slid into the doorway recess during transit because the shipper failed to use any doorway blocking.

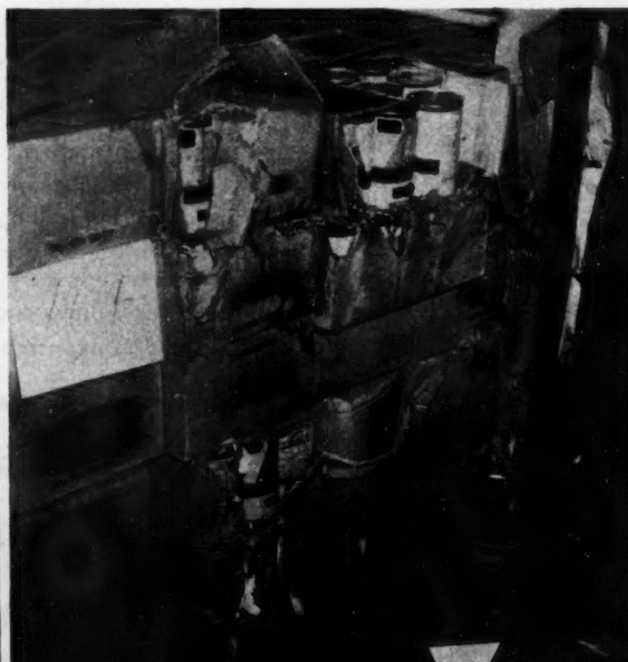


Figure 2—Result: the containers were ripped open along with their contents when the door with its projecting beams slid past them on opening.


Handling and container costs drop—with this efficient packaging
Multiwall paper bags, teamed up with speedy St. Regis packers, eliminate many manual operations, cut down storage space, make possible a sharp drop in container costs.
So flexible are these packaging systems that they lend themselves to a great variety of products. To date, over 400 commodities are being packed in multiwalls and new ones are constantly being added.
Are the hidden losses of an outmoded packaging operation holding back production and profits for *you?* If you suspect it, get in touch with the nearest St. Regis sales office for a discussion.
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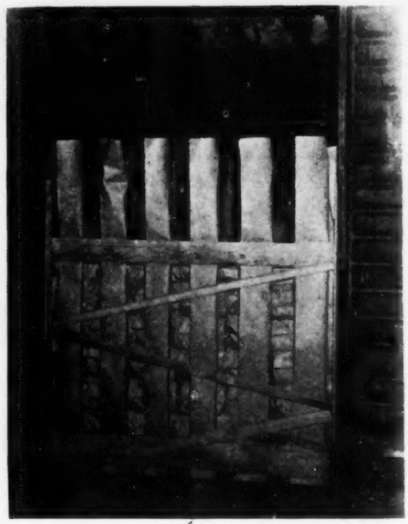


Figure 3—This is an instance of particularly fine doorway blocking. Solid wooden bracing is covered with heavy paper to prevent tearing of paper bags.

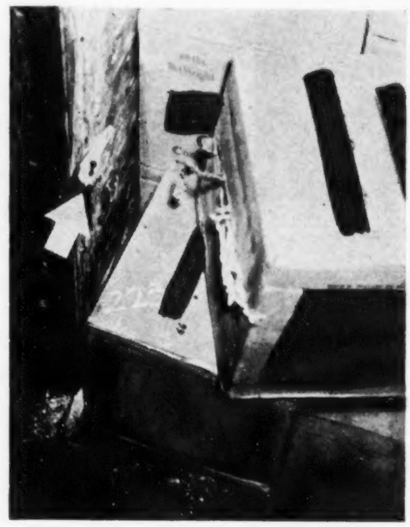


Figure 4—A protruding nailhead, left in this freight-car from previous use and not removed before loading, ripped open this container.

damage is avoidable. It can be eliminated by the shipper. A light should be brought into the freight car so that all nails, straps and wires left in the car can be discovered and removed. The few minutes effort which this requires is amply repaid by substantial reductions in damaged shipments.

ICC Regulations Amended

The Interstate Commerce Commission Regulations for the transportation of explosives and other dangerous articles were amended February 3, 1948, and we quote the following amendments which effect the chemical industry:

Section 186A (*Packing liquid per-*

oxides other than acetyl peroxide solution and hydrogen peroxide) is amended by the addition of the following:

(Add) (e) Spec. 42B.—Aluminum drums not over 15 gallon capacity. Authorized only for peroxides which will not react dangerously with the aluminum or be decomposed by contact with it.

Section 303, paragraph (k) has been amended by addition of the following table showing *Filling limit restrictions compressed gas:*

Kind of Gas	Maximum permitted filling density (see sec. 303(h))	Cylinders marked as shown in this column must be used except as provided in note 1 and sec. 303(p)(2) to 303(p)(6)
	Percent	
(Add) Difluoroethane	79	ICC-3A150; ICC-3B150; ICC-4B150
(Add) Difluoromonochloroethane	100	ICC-3A150; ICC-3B150; ICC-4B150
(Add) Monochlorodifluoromethane	105	ICC-3A240; ICC-3B240; ICC-4B240
(Add) Monochlorotrifluoromethane	100	ICC-3A1800; ICC-3

Section 303, table (q) (1) (*Compressed gases in tank cars and motor vehicles*) has been amended as follows:

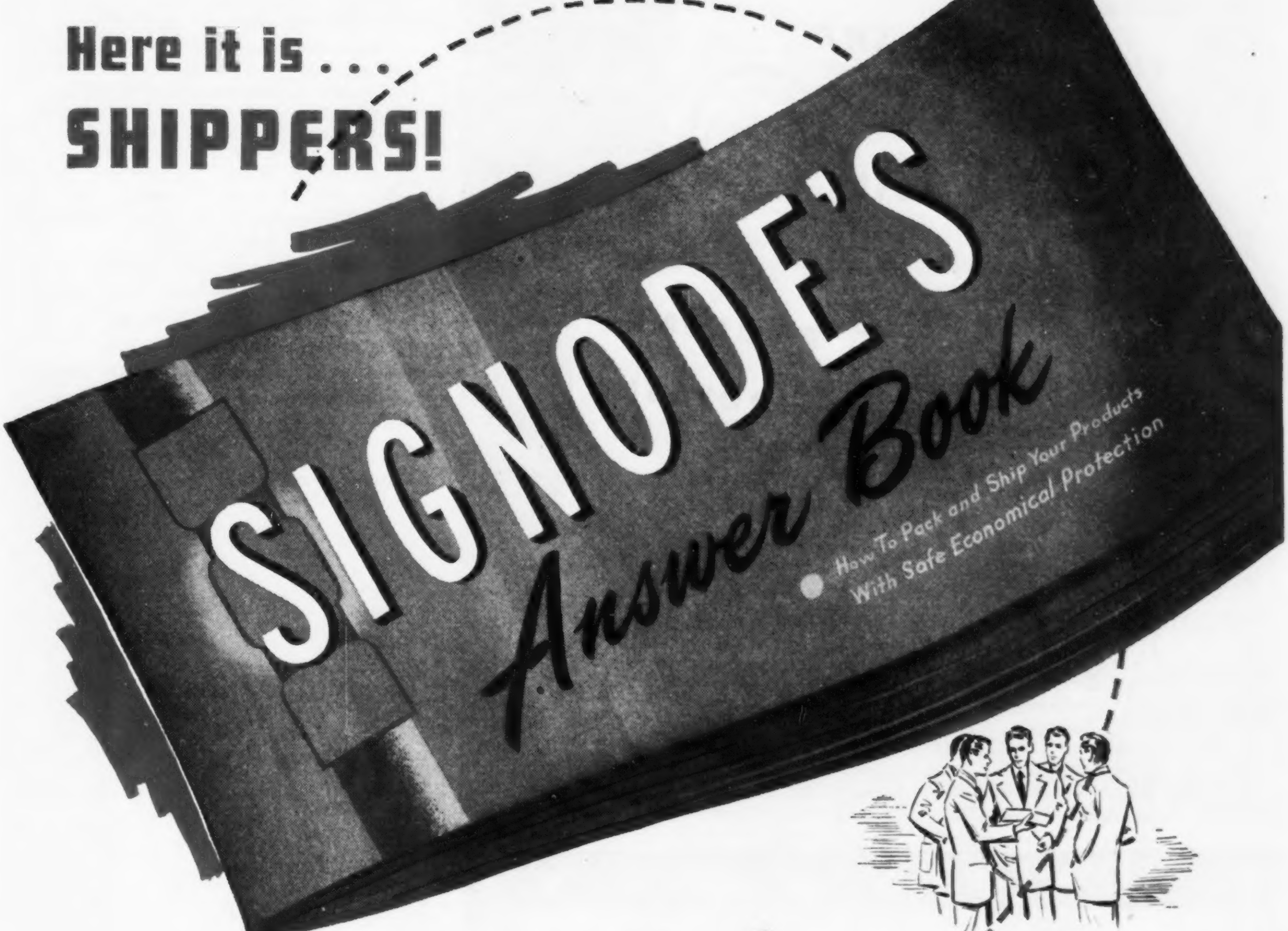
Name of gas	Maximum permitted filling density Note 1	Required type of tank car Note 2
(Add) Butadiene (pressure not exceeding 65 pounds per square in. at 105° Fahr.)	Note 3 only not including addendum)	ARA-IV and ICC-104 Note 15
(Add) Butadiene (pressure not exceeding 75 pounds per square in. at 105° Fahr.)	Note 3	Note 9 ICC-104A
(Add) Difluoroethane	79	ICC-106A500
(Add) Difluoromonochloroethane	100	ICC-106A500
(Cancel) Liquefied hydrocarbon gas (butadiene) (pressure not exceeding 75 pounds per square in. at 105° Fahr.)	Note 3	Note 9 ICC-104A
(Change) Monochlorodifluoromethane	105	ICC-106A500 Note 12

Section 272 (n) (*Packing sulfuric acid*), is amended as follows:

(n) Because of the present emergency and until further order of the Commission, sulfuric acid may be offered for transportation by carriers by water in conformity with Regulations for Explosives or Other Dangerous Articles On Board Vessels, section 146.23-10, issued by the Commandant of the Coast Guard.

Section 302A entitled *Manifolding Containers in Transportation* has been amended and if anyone is inter-

Here it is . . .
SHIPPERS!



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ested, this complete section of the Regulations should be consulted.

Section 263 (a) (9) (*Packing hydrochloric acid (emergency)*) is amended as follows:

(a) (9) Because of the present emergency and until further order of the Commission, hydrochloric acid may be offered for transportation by carriers by water in conformity with Regulations for Explosives or Other Dangerous Articles On Board Vessels, section 146.23-13, issued by the Commandant of the Coast Guard.

Section 303 (r) *Maximum permitted filling densities* for cargo tanks, spec. MC-320 unlagged portable tanks, spec. ICC-50, for transportation of liquefied petroleum gases, has been amended as follows:

Maximum specific gravity of the liquid material at 60°F.	Maximum filling density in percent of the water-weight capacity of the container—Unlagged containers
	Percent
0.271-0.289	26
0.290-0.306	27
0.307-0.322	28
0.323-0.338	29
0.339-0.354	30
0.355-0.371	31
0.372-0.398	32
0.399-0.425	33
0.426-0.440	34
0.441-0.452	35
0.453-0.462	36
0.463-0.472	37
0.473-0.480	38
0.481-0.488	39
0.489-0.495	40
0.496-0.503	41
0.504-0.510	42
0.511-0.519	43
0.520-0.527	44
0.528-0.536	45
0.537-0.544	46
0.545-0.552	47
0.553-0.560	48
0.561-0.568	49
0.569-0.576	50
0.577-0.584	51
0.585-0.592	52
0.593-0.600	53
0.601-0.608	54
0.609-0.617	55
0.618-0.626	56
0.627-0.634	57

Amending section 303 (*Packing compressed gases*), order August 16, 1940, as follows:

(Add) (s) Liquefied petroleum gases, to include propane, propylene, butenes (normal butane or isobutane), butylenes, and butadiene, or mixtures hereof, having a vapor pressure not to exceed 200 pounds per square inch gauge at 100° F., are authorized to be charged and transported by motor vehicle or by carrier by water in unlagged portable tanks specification ICC50. Authorized filling density must be in accordance with sec. 303(r) of these regulations.

Cancel paragraph (f), sec. 346 (*Packing methyl bromide*), order November 8, 1941.

Specification 360A (a) has been amended as follows:

(Add) 360A (a) Nitrochlorbenzene, meta or para, must be packed in specification containers as follows:

(b) As prescribed in sec. 361.

(c) Spec. 21A-Fiber drums, authorized only for nitrochlorbenzene,

We'd like to add a P.S. to this ad, now running in national magazines. It's this. In your field, Continental's outstanding with its wide variety of sizes and types of containers. *These include:* "Tripletite" friction-plug containers, and square or oblong "F-style" cans—plain or lithographed with your own design.

para, flaked, gross weight 400 pounds; side walls must be of at least 10-ply construction having strength not less than 1,200 pounds Mullen or Cady test; in addition to tests prescribed by par. 4, spec. 21A, a drum must withstand two drops from a height of 6 feet to solid concrete, the first drop to be made diagonally on bottom chime and the second drop diagonally on the top chime; when heads are made of wood, the grain of the wood must run parallel to concrete surface.

A new specification, ICC 50, Unlagged Portable Tank Containers for Transportation of Liquefied Petroleum Gases in Export and Domestic Service has been approved. Anyone interested in this type of specification container should consult the Regulations for complete specification.

Packaging Week April 26-30

"Proper Packaging Protects the Product and the Purchaser" is the theme for Packaging Week, April 26 through 30, during which the $7,500,000,000 packaging industry will emphasize the economic advantages of improved packaging, packing, and shipping to manufacturers, distributors and consumers.

Protection against damage and deterioration, convenience, assurance of quality through product identification, and the role of packaging in making products available at greater distances from the point of origin with consequent lowering of cost will be among the features of packaging stressed.

Emphasis on packaging at the industrial level and through retail outlets of package users will coincide with AMA's 17th Annual Packaging Exposition and Conference, at the Municipal Auditorium in Cleveland, where the latest developments in packaging will be displayed and discussed by an estimated 16,000 executives and specialists.

At the concurrent AMA Conference, warehousing methods and techniques, packaging perishable agricultural products, effective and economic methods of printing, package machinery maintenance, interior packaging, and simplification of packaging specifications will be discussed.

Light-Weight Skeleton Pallet

A new approach to palletizing is seen in the all-steel skeleton pallet, which combines light weight, durability, low first cost and low upkeep. Welded steel construction of a semi-open framework design produces a pallet weighing 65 pounds that can be loaded or unloaded by fork trucks.

The standard size skeleton pallet for the handling and storage of 55 gallon drums measures 48" x 48" overall and is particularly suitable for the palletizing and depalletizing of drums, barrels, and rectangular

types of firm containers. Other sizes are made for various size drums and rectangular packages.

The pallet is manufactured by Pacific Chain & Mfg. Co., 4200 N. W. Yeon Ave., Portland 10, Oregon.

PLANT OPERATIONS NOTEBOOK

Ventilation Tips for Small Solvent Users

The operator or manager of the small plant or shop and the occasional user of solvents frequently need the ventilation requirements for solvent use. Unless degreasing, thinning, cleaning, etc., are provided with adequate ventilation, workers can inhale dangerous quantities of solvent vapors.

For occasional solvent operations, if possible, it is best to do the job outdoors on a breezy day. If done indoors, it should be carried out in an airy room near an open window. If adequate natural ventilation is not available, canister gas masks provide adequate protection. The mask, of course, protects only the worker who wears it, and care must be taken that other workers in the room are not exposed to the vapors. For large jobs which are done only at intervals, a portable blower may be the most practical method of providing protection.

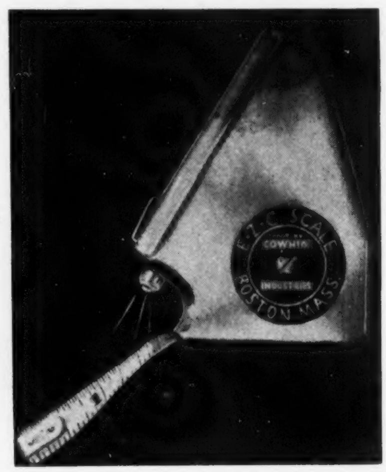
Where solvents are used constantly or frequently, special ventilating equipment is usually necessary. The equipment may be designed to ventilate the entire workroom. In this case, attention should be given to the area immediately around the solvent operation. For example, a man using solvent to wipe machine parts may be inhaling too much vapor, even though the rest of the room is safe.

Often it is best to use equipment which ventilates locally, that is, which removes the solvent vapor at the point it is released, before it spreads through the workroom. Thus, a ventilated booth, an exhaust hood over the workbench, or a work table with ventilator slots around its edge, can protect the operator and also prevent contamination of the air in the rest of the workroom.

Large continuous solvent operations require the use of fully or partly enclosed equipment from which solvent vapor cannot escape. Even the small plant or shop may find such an installation worth while for an important solvent operation.

The operator of a small plant can obtain assistance on ventilating problems from the industrial hygiene service of his local health or labor department.

Illuminated Ruler



A small lamp illuminates the scale of a 6′ flexible tape produced by Cowbig Industries, Inc., and provides a good view of the scale in the darkest corners.

NOMOGRAPH-OF-THE-MONTH

Edited by DALE S. DAVIS

Readers are invited to submit for publication in this department any original nomographs pertaining to chemistry or engineering. $10 will be paid for each one used.

Nomograph for Determination of the Edmister Effective Absorption Factors

by GEORGE E. MAPSTONE
National Oil Pty., Ltd.
Glen Davis, N.S.W., Australia

BY the introduction of effective absorption factors based on the terminal conditions of the absorber or stripper, Edmister (2) modified the

complex but accurate absorption factor equation of Horton and Franklin (3). The modified equation is

$$E = \left[1 - \frac{L_o\ X_o}{A'V_{n+1}\ Y_{n+1}}\right] \left[\frac{A_e^{n+1} - A_e}{A_e^{n+1} - 1}\right]$$

E = efficiency of absorption of component

L_o = moles of liquid entering absorber in unit time

V_{n+1} = moles of vapor entering absorber in unit time

X_o = moles of component entering absorber with liquid in unit time

Y_{n+1} = moles of component leaving tower with vapor in unit time

n = number of theoretical plates in absorber

A′ and A_e are effective absorption factors and are defined in the following manner:

$$A_e = \sqrt{A_n(A_1+1) + 0.25} - 0.5$$

and

$$A' = \frac{A_n(A_1+1)}{A_n+1}$$

where

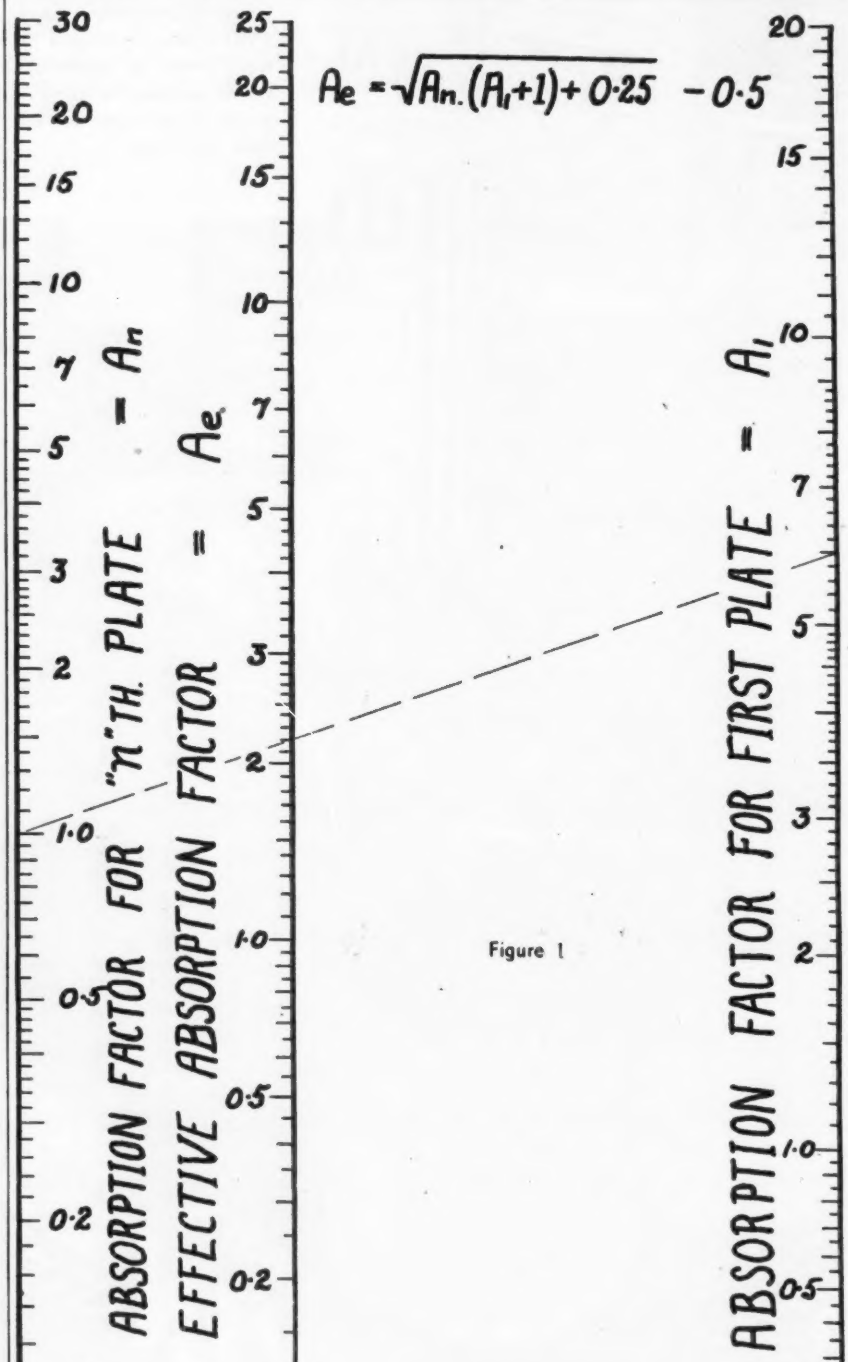


Figure 1

Why Chemico-built Plants are Profitable

Improved Processes

A chemical plant is only as good as the process it uses. Chemico originates, controls, and provides many of the most advanced processes and equipment . . . develops entirely new processes where necessary.

Individually Designed

Chemico-built plants are designed to meet each client's requirements. Capacity, type of raw material, available utilities, location, space limitations . . . all are considered.

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Automatic operation, centralized control, efficient plant layout . . . reduce manpower requirements and make more productive use of every man-hour.

Minimum Maintenance

Maintenance problems are simplified through the use of carefully selected equipment and improved processes, and careful layout of the plant. Repairs are never "hard to get at."

Experience

Chemico designs and builds many kinds of heavy-chemical plants . . . has been doing this for 34 years. Over 600 installations the world over are evidence of Chemico's successful experience.

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"Chemical plants are profitable investments"

CC 108

A_1=absorption factor for top plate of absorber

A_n=absorption factor for bottom plate of absorber

Analogous equations give the effective stripping factors for stripping operation.

These nomographs have been designed to solve for the effective absorption (or stripping) factors and the use of the charts is illustrated as follows: What are the effective absorption factors, A_e and A′, when the absorption factors for the first and *n*th plates are 6 and 1, respectively? In Figure 1 connect 6 on the A′ scale with 1 on the A_n scale and read one of the desired values, A_e, as 2.20. Figure 2, when used in a similar manner, yields A′=3.5.

When employed in conjunction with one of the available nomographs (1,4) for the solution of the Souders-Brown equation (5) these nomographs greatly simplify the use of the Edmister equation.

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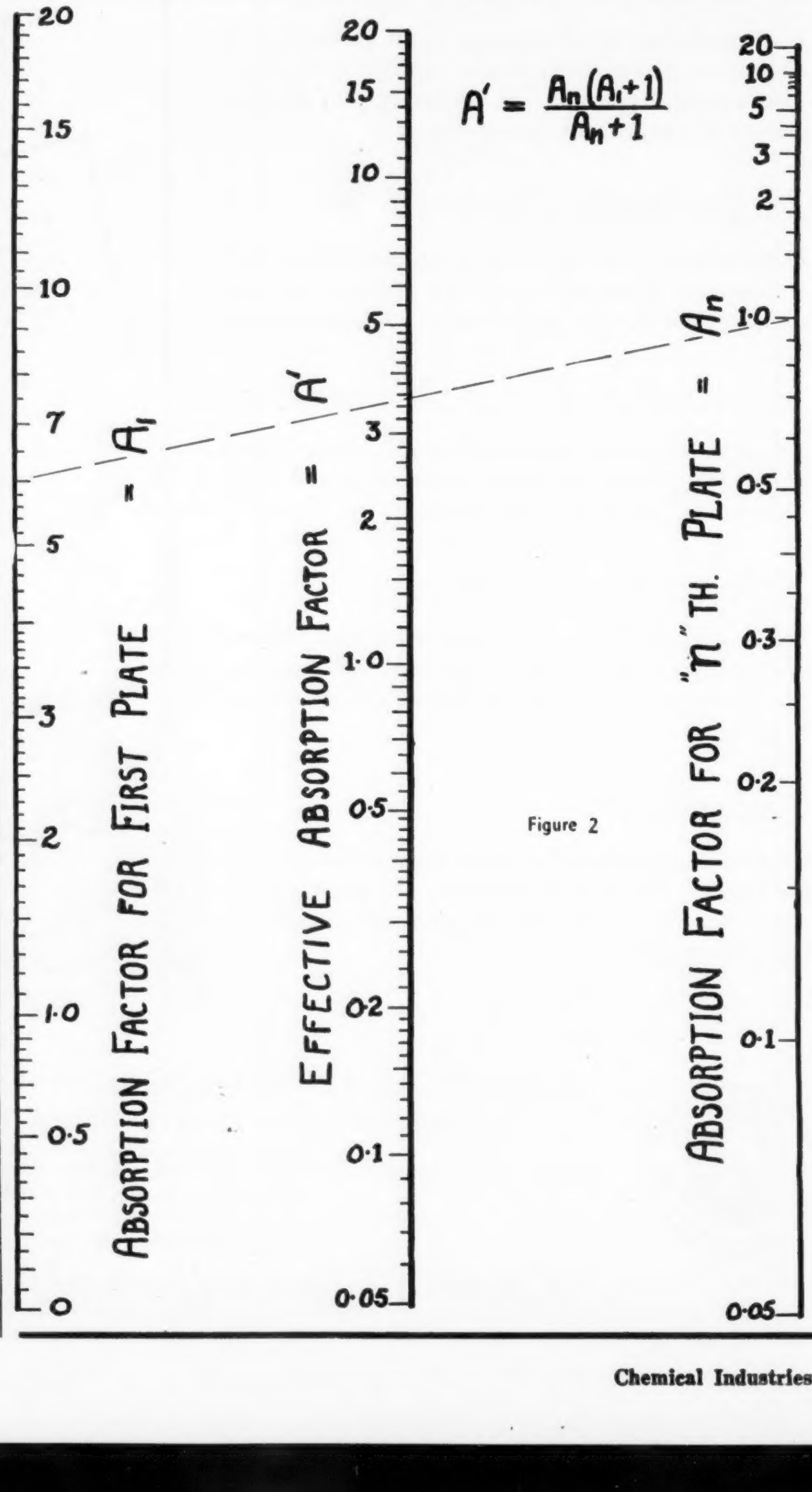

Figure 2

"CLEAR THE ROAD!"

Thrills and chills raced up Grandpa's spine when the thundering fire team careened down Main Street . . . It was about that time, 50 years ago, that the development of light fraction petroleum refining was going on at Standard Oil . . . study that has led to the wide variety of Esso Solvents grades that are serving industry today, from fireproof coatings to furniture polish!

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are made to meet the exacting requirements of the paint, rubber and textile industries, among the many they serve. They are made with the correct chemical inertness to the material being used, with ample dissolving ability and a volatility that permits easy removal by distillation or evaporation.

There are many grades of high quality Esso Solvents for many purposes, and our technical staff will welcome a chance to study your particular solvents requirements or problems. Call or write us at the nearest office.

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ESSO STANDARD OIL COMPANY OF PENNSYLVANIA–Philadelphia, Pa.

LABORATORY NOTEBOOK

Indicating Temperature by Color Change

An entirely new development in temperature indicators is now being produced by Kolor Therm Indicator Corp. It indicates the temperature by color.

Simple to use, "Kolor-Therm" on electrical appliances, chemical apparatus, motors and other mechanical devices lets you know in an instant if the temperature is rising. It is yellow at 100° F (38° C) or less, it turns gradually from orange to red as temperature increases. Comparison with color stands gives the approximate operating temperature, and danger point can be seen. Full red indicates the danger point. "Kolor-Therm" again becomes yellow upon cooling. It is produced to indicate 190° F (88° C), 250° F (121° C).

Heavy Duty Laboratory Centrifuge

Gerin Corporation of Red Bank, N. J., offers a heavy duty hand power centrifuge designed to swing two or four 100 cc tubes with minimum effort.

The unusual features include ball bearings throughout, and a 24-to-1 gear ratio, permitting reduced crank speed. The outer diameter of swing is 16 inches and there is a stationary guard bowl to reduce air resistance and protect the operator from whirling parts. The entire unit can be stowed in the bowl when not in use.

This centrifuge is ideal for many tests in plants which are processing or using petroleum products, foods, paints, pharmaceuticals, and for general laboratory uses involving precipitation, sedimentation, or extractions.

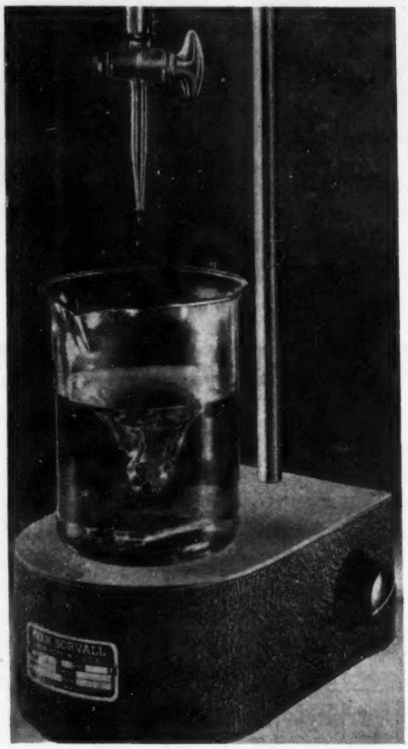
Glassware Washer

A safe and simple means for cleaning small laboratory glassware such as beakers, flasks and graduates with corrosive acids is the new desk-size Harris-Mitchell glassware washer now available from Fisher Scientific Company, 717 Forbes Street, Pittsburgh 19, Pa.

The washer consists of a lower portion shaped like a florence flask in which an upper portion shaped like a funnel is inserted. A side tubulature with rubber bulb permits the user to force air into the lower portion, creating a pressure which forces the cleaning solution into the funnel portion where the glassware is held. A strong jet of chromic acid solution, for example, floods the beaker interior which then is flushed with tap water and distilled water before use.

Magnetic Stirrer

The Rosinger Magnetic Stirrer marketed by Ivan Sorvall, Inc., 210 Fifth Ave., New York 10, N. Y., finds application in such laboratory functions

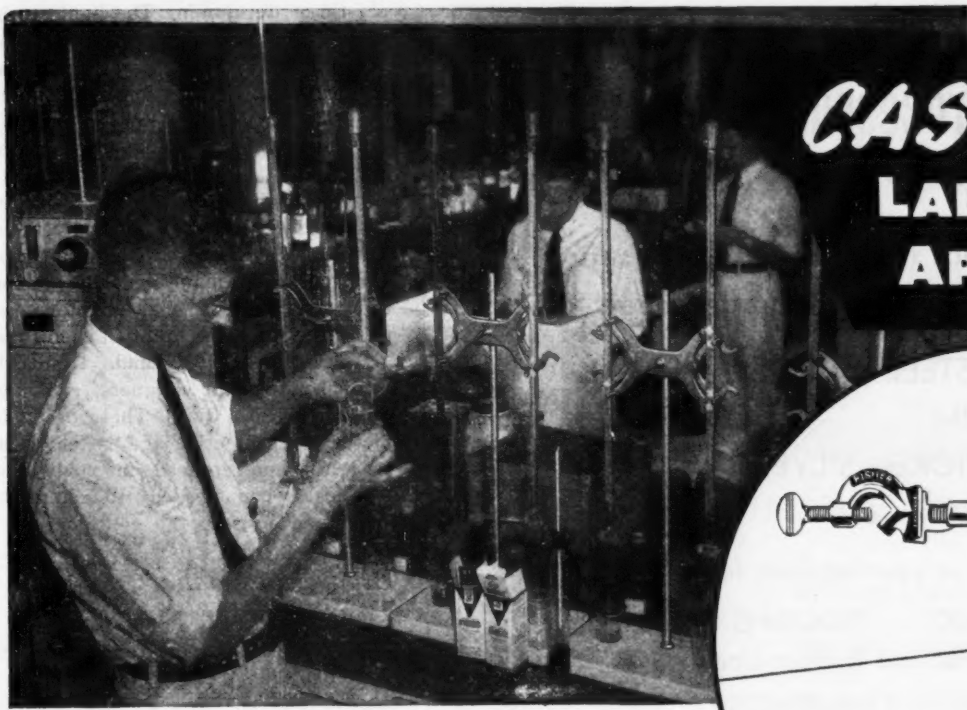


as titrations, catalytic hydrogenation experiments, stirring in closed systems under pressure or vacuum, and stirring very small amounts of liquid —a few ml.—as in microchemical work.

The principle of operation of this stirrer is to cause a magnetic bar, covered with a protective coating, to rotate in a liquid contained in a vessel of non-magnetic material. The rotation of the magnetic bar (or rotor) stirs the liquid. This motion of the magnetic bar is effected by a rotating magnetic field, which is created by a permanent magnet, kept in motion by a motor.

The permanent magnet is made of a highly magnetic alloy. This motor-attached magnet is encased in a cast-aluminum housing together with a rheostat for controlling the speed of the motor and the rate of stirring.

The housing has a flat top of white



CASTALOY

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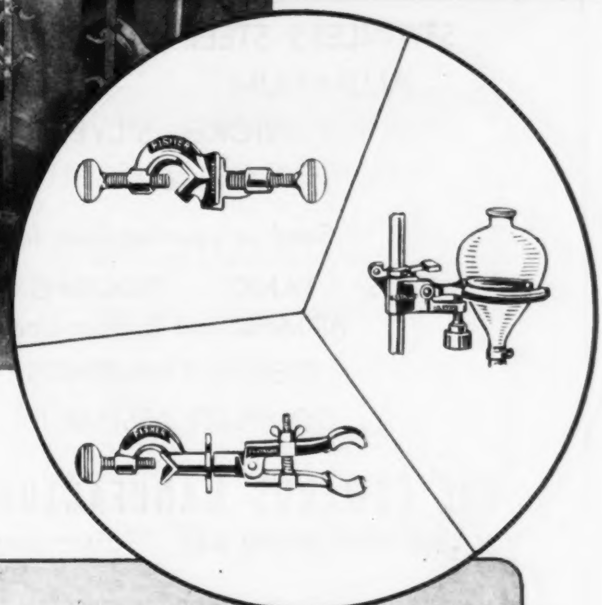
LABORATORY APPLIANCES



The Modern Burette Support with Castaloy Burette Holder, shown in series above, is standard equipment in thousands of laboratories. It is available, with porcelain base at $8.50.

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plastic or duralumin. The liquid to be stirred is poured into the vessel and placed on top of the stirrer. Then the stirrer is put into motion by dropping the stirring element (or rotor) into the liquid and switching on the rheostat.

In using it as a multiple magnetic stirrer either in open or sealed vessels, identical stirring conditions in a series of samples are maintained by placing the tubes in a special adapter, and using the same size rotor in each tube.

Stirring elements, made from Alnico 5 permanent magnets, are supplied in various sizes. These are gold plated for protection against chemical reagents and encased in rubber or plastics, when needed, to eliminate noise and protect the containers.

Dial Type Pocket Thermometer

A pocket thermometer, a reduction of the Weston testing thermometer, is the product of Scientific Glass Apparatus Co., Inc., Bloomfield, New Jersey. As handy as a fountain pen carried in the pocket, it incorporates every feature of the larger model. Because it is unbreakable, the thermometer is especially valuable where a product might be ruined by the breaking of a mercurial thermometer bulb.

This stainless steel thermometer has a stem ⅛″ in diameter and 5″ long. The dial is only one inch in diameter and is protected by an unbreakable plastic crystal. Accuracy is guaranteed to 0.5% of the scale range.

The instrument is furnished complete with a plastic casing equipped with a clip. A novel feature is the hole drilled diametrically through this casing, permitting its use as a holder and preventing burned fingers when used over hot vapors.

Four ranges are available, (0-220°F, 50-500°F, 0-150°C or 0-250°C), all priced at $6.65.

Mass Spectrometer

A new recording mass spectrometer capable of measuring over the mass range from 1 to 350 and adjustable to any portion of that range, has been introduced by the General Electric Company. This new instrument incorporates the control and stability features which have made the mass spectrometer a practical method for the chemical analysis of gases and vapors in the rapidly developing fields of atomics, nucleonics, and ionics.

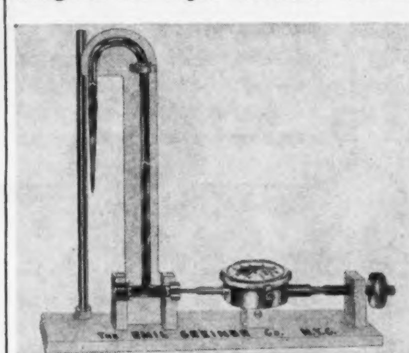
The new instrument is applicable to general chemical analysis and isotope abundance measurements. The mass spectrometer method of chemical analysis often reduces the number of

time-consuming steps of complicated reaction and reduction processes to a single electrical separation with automatic recording of mass constituents, all completed in a few minutes' time.

The instrument is built in two main units for easy inspection and maintenance. The control unit contains the electronic components and recorder, while the tube rack houses the spectrometer tube, vacuum pumps, gages, sampling system, and additional components.

Ultra-Microburet

The new Gilmont Ultra-Microburet, developed by The Emil Greiner Co., 161 Sixth Avenue, New York City, is designed for rapid titration without



nerve-racking manipulation.

In the new Gilmont Ultra-Microburet, a precision stainless steel plunger displaces mercury in a reservoir sealed off by a silicone rubber gasket contained in an aluminum bushing. The displaced mercury in turn forces a precisely determined amount of titrating solution through the fine orofice immersed in the solution being analyzed.

The diameter of the plunger is ground to the required size so that the precision dial micrometer gauge reads directly in volume units. The mercury reservoir is made as small as possible so that temperature fluctuations are made as negligible as in ordinary micro titrations. Back diffusion into the capillary tube has been found to be practically eliminated by virtue of the fine orifice. Stirring of the solution may be effected by a fine stream of air bubbles.

This principle of operation eliminates errors in drainage and meniscus reading, and permits new ease of manipulation together with the high precision.

Constructed entirely of corrosion-resistant materials, the Ultra-Microburet has a total displacement of 0.1 ml. (in 0.0001 [1/10,000] ml.) with accuracy of 0.03% of total displacement. Microburets for total displacements of 1 ml. in (1/10,000 ml.) of 0.01 ml. (in 1/10,000 ml.) are also available upon special order.

SYNTHETIC DETERGENTS

(Continued from page 585)

taining glycerine and long chain alcohols and acids from sources other than the vegetable or animal oils. Coal and petroleum are the only other sources from which large amounts of hydrocarbon products can be obtained cheaply. Of these, petroleum at present shows the greatest possibilities. A plant for the production of glycerine from propylene is in construction and it is expected to be placed in operation shortly. The cost of glycerin obtained from this process will be somewhat higher than the lowest prices prevalent in the prewar era, but at the same time they are expected to be lower than they are today. The effect of synthetic glycerine on prices will be a stabilizing one. It should go a long way toward giving a firm base to the sulfated monoglyceride type of detergent and perhaps will lead to its reduction in price and thus place it in a better competitive position with soap.

Long chain alcohols may be made from one of the high olefin containing fractions that are obtained from the Fischer-Tropsch synthesis using the Oxo process. It has been estimated that long chain mixed alcohols can be produced at a cost of 10 to 15 cents per pound. At this price, the sulfated alcohol type surface active compounds will become highly competitive with soap and with other classes of synthetic detergents.

It may be concluded that at the present time the sulfated alcohols and sulfated monoglycerides will probably not offer serious competition to soap in so far as price is concerned. The main use of these compounds will arise from the specific wetting and detergent properties which these surface active agents possess and that are not possessed by soap.

If in the future the petroleum industry is able to supply large quantities of cheap long chain alcohols and glycerines at stable prices, then it is probable that detergents made from these raw materials will offer serious competition to soap.

ALKYL ARYLS CHEAPEST

The next major class of surface active agents are the alkyl-aryl sulfonates. These are truly synthetic in nature and are derived exclusively from petroleum or coal tar products.

Their general method of preparation is as follows: A paraffinic petroleum fraction, usually the kerosene cut, containing C_{10} to C_{16} hydrocarbons is mono-chlorinated. Benzene (or naphthalene) is then alkylated with this chlorinated mixture by means of the Friedel-Crafts synthesis. The alkylate is purified by distillation, sulfonated with 100% sulfuric acid and finally neutralized with alkali. The neutralized sulfonate may then either be extracted with alcohol, in order to obtain the pure sulfonated compound, or various inorganic salts or other surface active agents may be added to act as builders.

The alkyl-aryl sulfonates are by far the cheapest synthetic surface active agent. On a 100% basis they cost between 32 and 40 cents a pound. In commercial concentrations of 35 to 40% active ingredient, they cost 13 cents a pound.

At present it would seem that this type of surface active agent will provide the strongest competition to soap. This is borne out in the current trends. Some of the large soap companies who have been manufacturing surface active agents derived from vegetable oils are beginning to make arrangements to use the alkyl aryl sulfonates. The principal incentives are lower cost, greater and more stable supply of raw materials, and somewhat lower plant costs.

It is doubtful that these synthetic materials will ever displace soap. Their expansion will arise from the new uses that will be found for them. These uses are being directed more and more into fields where soap had never entered. New markets are thus being continually found.

Many small soap manufacturers are buying these various basic surface active agents and blending them with other materials in order to obtain special wetting, emulsifying, penetrating or cleaning effects. Others are buying the unsulfonated hydrocarbon and doing their own sulfonating and special blending. The choice is largely a matter of the investment required and the cost of production.

Special and unique uses for synthetic surface active materials are continually being discovered. It is here that the greatest development in the use of synthetic materials is expected. With the present rate of growth, the industry estimates that the production of synthetic surface active agents will be over 1 billion pounds in the next two years.

RAW MATERIAL PICTURE

In the following paragraphs, the raw material supply picture will be discussed with respect to the synthetic surface active agents.

It is estimated that the production of sulfated alcohols and sulfated glycerides would use about 76 million pounds of coconut oil in 1947 based on a production of 100 million pounds of 100% active material. Imports of

coconut oil and copra (oil equivalent) for the first ten months of 1947 amounted to about 677 million pounds[1], and for the entire year will probably be about 810 million pounds. Thus the synthetic surface active industry in 1947 will have used about 10% of the available supply. As has been pointed out earlier, it is estimated that the amount of coconut oil that will be imported into this country in 1948 will be anywhere from 10 to 20% less than was imported in 1947. This means that there will be an increasing competition between the uses of this oil for edible products, such as shortening and margarine, particularly since expected butter production will be smaller in 1948.[1]

It would seem, therefore, that this supply situation may have a serious effect on the production of those synthetic products made from coconut oil. The production of synthetic fatty alcohols by the synthetic gasoline plants will not affect this picture for at least two years.

The amount of benzene required to produce 100 million pounds of 100% alkyl aryl sulfonate is estimated to be about 25 million pounds. The estimated total production of chemical benzene for 1947 is 160 million gallons[2], which is equivalent to approximately 1.2 billion pounds. The uses of benzene in 1947 for the manufacture of aniline, maleic anhydride, dichlorobenzene, diphenyl, a great diversity of miscellaneous chemicals, and special solvent uses are estimated to have consumed about 400 million pounds of benzene[3]. This left about 800 million pounds of benzene for phenol, styrene, nylon and detergents.

The thought is expressed by Weiss[3] that the reasonable balance that has existed between supply and demand of benzene up to the present will, in the not too distant future, be upset by the continued growth and expansion of the phenol and styrene industries. If this occurs, the alkyl aryl detergent industry could feel the pinch of higher prices and short supply of one of their main raw materials. The only relief that might be expected is by the increased production of petroleum benzene. This seems unlikely until the price of benzene reaches a much higher figure than the present one of around 20 cents per gallon.

However, since the amount of benzene at present required to meet the production demands of alkyl aryl sulfonates is only about 1.5% of the total benzene produced in the United States, it is not believed that any possible shortage of benzene will seriously affect this industry.

Therefore, of the two principal surface active agents, the indications are

(*Turn to page 658*)

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SYNTHETIC DETERGENTS

(Concluded from page 652)

that the alkyl aryl sulfonates will be the more widely accepted and manufactured all around surface active agent. This will be due to: (1) cheapness of raw materials, (2) greater availability of the raw materials in the immediate future, (3) the fact that new plant construction costs will be lower for the alkyl aryl detergent, and (4) the selling price of the product can be materially less than the coconut oil derivatives. It is expected that the production of these materials in 1948 will be double what they were in 1947.

The future trends of the other types of surface active agents listed in Table II is not clear. It is probable that the production of non-ionic types such as the polyhydric alcohol esters and ethers will increase at a fairly steady rate, particularly as their emulsifying and foaming properties are exploited.

The production of cationic materials will probably remain at present levels since these compounds generally can be used only in acid or neutral solutions. They are also incompatible with the more commonly used anionic compounds.

The production of naphthalene alkyl sulfonates will have a tendency to decrease chiefly due to the very tight supply of naphthalene, the higher price of naphthalene, and the generally poorer properties of the alkyl naphthalene compounds compared with the alkyl benzene sulfonates.

REFERENCES

1. U. S. Department of Commerce, Industry Report—Fats & Oils, Jan. 1948.
2. U. S. Department of Commerce, Industry Report—Chemicals & Drugs, Jan. 1948.
3. Weiss, J. M., Chem. & Eng. News. 26, 238, (1948).

NEWS OF THE MONTH

Du Pont Grants Free Licenses

The Du Pont Company has granted free licenses to 50 paint and lacquer companies for the manufacture of a new type of metallic finish which Du Pont markets as "Duco" Metalli-Chrome lacquer.

The licenses provide not only for the use and sale of the lacquer itself under a product patent but also for that part of another patent covering the process for its manufacture. Free licenses will be granted to all interested paint and lacquer manufacturers who request them.

Metalli-Chrome lacquers are extremely durable and provide rich, lustrous colors and color effects. They are designed for railroad coaches, automobiles, and other metal objects such as cash registers, calculating machines, typewriters, filing cabinets, metal furniture, novelties, and vending machines.

Texas Elf Names Burdette

Hugh Burdette, elected president of Texas Elf Carbon Co., partly owned Cabot Carbon subsidiary. He has been vice-president of Cabot Carbon.

Finance Mexican Ammonium Sulphate Plant

The Mexican Embassy in Washington and the Export-Import Bank have announced that the bank has authorized a credit of up to $6 million to Nacional Financiera, S.A., a financial agency of the Mexican Government, for the purchase of United States equipment, materials, and services required for the construction of an ammonium sulphate plant near Mexico City.

This credit was authorized in accordance with the commitment made by the Export-Import Bank to extend credits aggregating $50 million to finance projects approved by the Mexican Government and acceptable to the bank.

The proposed ammonium sulphate plant is to be constructed and operated by Guanos y Fertilizantes, S.A., which is wholly owned by Nacional Financiera. The total investment required to establish the plant is estimated at $10 million. The plant is to have a daily capacity of 200 short tons of ammonium sulphate, which is to be produced from ammonia synthesized from natural gas and sulphuric acid manufactured from raw sulphur.

Atomic Energy Plant

Monsanto Chemical Company has selected a site northeast of Marion, Ohio, for the establishment of a new atomic energy installation as part of the Atomic Energy Commission's nationwide construction and research program.

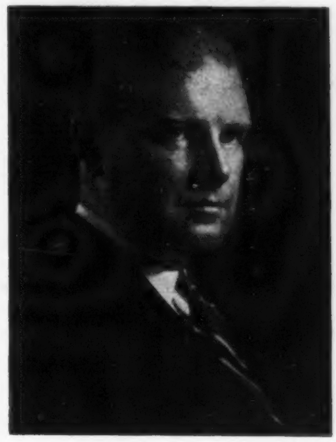
The installation will be used for the investigation of basic chemical problems in the field of atomic energy, and will be located five miles northeast of Marion at the site of the Scioto Ordnance Works. The AEC is acquiring approximately 1200 acres of the 12,000-acre tract from the War Assets Administration.

Existing facilities will be utilized as much as practicable, including warehouses, a garage, shops, power plant and a sewage and water system. A study is currently being made to determine what additional buildings will be needed.

Puerto Rico Encourages Investments

To encourage new enterprise in Puerto Rico, the Government of Puerto Rico has decreed full exemption from insular income and property taxation, until June 30, 1959, and partial exemption for three additional years, for all manufacturers of ceramics, cosmetics, rugs, soap, tannery products, and vegetable oils. Since in most cases federal income taxes do not apply to firms producing in Puerto Rico for local or mainland markets, this tax exemption will take care of the seasoning costs of a new enterprise, facilitate "plowbacks," and invite penalty-free accumulation of depression reserves; in short, it offers liberal incentives for investments in productive enterprises in the Island.

Park Heads Salesmen



James G. Park, vice-president of Enjay Co., Inc., recently installed as president of the Salesmen's Association of the American Chemical Industry. Other officers for the current year: vice-president, Albert Loeffler, Monsanto Chemical Co.; treasurer, Charles V. Douglas, Diamond Alkali Co.; secretary, Paul W. Hiller, Innis, Speiden & Co.

Military Petroleum Advisory Committee

Bruce K. Brown, vice president of Standard Oil Co. (Indiana), Chicago, Ill., and chairman of the Military Petroleum Advisory Committee, has announced members of industry committees who are making a survey of the significance of synthetic fuels in connection with national security for MPAC.

The Synthetic Fuels Committee of MPAC falls in the general jurisdiction of R. G. Follis, Standard Oil Co. of California, San Francisco, Calif., who is chairman of the Refining Panel of MPAC. The committeemen, after being nominated by MPAC, were specially appointed for this service by the Army-Navy Petroleum Board and the Department of the Interior.

Talbot Joins R. T. Collier

William F. Talbot, elected vice-president of the R. T. Collier Corp. He has been executive director of the Stanford Research Institute.

Radioisotope Shipments

Forty-four shipments of radioactive isotopes have been sent abroad to individuals and research groups in eight countries since the start of foreign distribution of radioisotopes, according to the U. S. Atomic Energy Commission.

Countries which have so far made arrangements to obtain the radioisotopes from the uranium chain-reacting pile at Oak Ridge, Tennessee, are Australia, United Kingdom, Canada, Italy, New Zealand, Argentina, The Netherlands, Denmark, Peru, Cuba, France, Belgium, Union of South Africa, Sweden, Ireland, and Switzerland. Of these, shipments have been made to Australia, Argentina, United Kingdom, Denmark, Peru, Canada, Italy and Sweden.

In the six-months period in which 44 shipments have gone abroad, approximately 1,000 shipments of radioactive isotopes have been made to investigators within the United States. Since August 2, 1946, when the domestic distribution program was announced, approximately 2,200 shipments have gone to research groups within the United States.

Radiophosphorus has been exported more than any other isotope; it is used mainly in medical therapy for treatment of serious blood diseases, polycythemia vera and chronic leukemia. Other investigators are employing this isotope in fundamental studies of plant growth, phosphorus metabolism in the body, and the use and deposition of phosphorus in bones and teeth.

Radioactive iodine has been shipped to several countries for medical treatment of thyroid disorders and for studies of the function of the thyroid gland. This radioactive element, in the case of ordinary stable iodine, is preferentially picked up by the thyroid and thus serves as an invaluable means of studying this gland and for treating thyroid diseases.

Isotopes of carbon, sulphur, zinc, iron and cobalt have been sent to foreign research groups for work in chemistry, physics, biochemistry, physiology and botany.

CALENDAR *of* EVENTS

AMERICAN ASSOCIATION OF CEREAL CHEMISTS, 33rd annual meeting, Netherlands Plaza Hotel, Cincinnati, May 23-28.

AMERICAN GAS ASSOCIATION, spring conference, Windsor, Ontario, Canada, April 7-9.

AMERICAN INSTITUTE OF CHEMISTS, annual meeting, Hotel Pennsylvania, N. Y., May 7.

AMERICAN MANAGEMENT ASSOCIATION, 17th annual packaging exposition, Public Auditorium, Cleveland, April 26-30.

AMERICAN OIL CHEMISTS' SOCIETY, 39th annual meeting, New Orleans, May 4-6.

ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, INC., Hotel Sheraton, N. Y., April 28.

PITTSBURGH INTERNATIONAL CONFERENCE ON SURFACE REACTIONS, Mellon Institute for Industrial Research, Pittsburgh, June 7-11.

SOCIETY FOR APPLIED SPECTROSCOPY, annual meeting, Polytechnic Institute of Brooklyn, Brooklyn, N. Y., May 22.

SOCIETY OF COSMETIC CHEMISTS, Biltmore Hotel, N. Y., May 19.

SOCIETY OF THE PLASTICS INDUSTRY, annual meeting, Ambassador Hotel, Atlantic City, N. J., May 20-21.

THIRD NATIONAL INSTRUMENT CONFERENCE AND EXHIBIT, Philadelphia Convention Hall, Sept. 13-17.

Armour Appoints Leedy

Haldon A. Leedy, named acting director of the Armour Research Foundation. He succeeds Jesse E. Hobson.

Government Holds Plants

Sale of approximately 10 Army ordnance works has been suspended in order to give the Army and other government agencies more time to decide if the plants should be retained for their use.

The plants were originally offered for sale in December. A decontamina-

tion problem exists with respect to some, if not all the plants, which was a hindrance to ready sale. However, the Army subsequently indicated a new interest in some plants, and other government sources wanted time to check the possible further usefulness of the facilities before they were released.

Press Opens Business

J. J. Press, who is now in business as a consulting chemist in New York City. He was formerly vice-president and director of textile research for the Manufacturers Research Laboratories.

General Aniline to Release Patents

General Aniline & Film Corp., recently announced that it would offer licenses to the public under some 3,500 patents.

Included in the offer will be valuable patents in the dyestuffs, photographic, industrial chemical and textile fields. The offer contemplates the granting of non-exclusive licenses on reasonable terms.

The company will prepare abstracts of the available patents and will publish a brochure containing these abstracts for the benefit of prospective licensees. The offer will be further implemented by entry of the patents on the Register of Patents Available for Licensing or Sale maintained by the Patent Office in Washington. Applications for licenses will be entertained at the office of the company at 230 Park Avenue, New York 17, N. Y.

This offer was worked out in conjunction with the Office of Alien Property, Department of Justice, which controls the company by reason of the vesting of more than 90% of the company's capital stock. The corporation is believed to have one of the most valuable and extensive patent portfolios of any chemical company in the United States.

Chemical Company Annual Earnings

	1947 Net Income*
Allis-Chalmers Manufacturing Co.	$ 5,422,308
Abbot Laboratories and subsidiaries	10,216,165
American Cyanamid Co.	9,156,249
American Smelting & Refining Co.	36,773,231
Allied Chemical & Dye Corp.	30,311,484
B. F. Goodrich Co.	23,231,063
Celanese Corp. of America	24,173,417
Canadian Celanese, Ltd.	3,025,462
Columbian Carbon Co.	6,064,196
Dominion Tar & Chemical Co., Ltd. and subsidiaries	1,451,299
E. I. Du Pont de Nemours & Co.	120,010,000
Federal Mining & Smelting Co.	1,974,064
Freeport Sulphur Co.	3,110,711
Industrial Rayon Corp. and subsidiary	13,460,416
Libbey-Owens-Ford Glass Co.	11,173,075
Merck & Co.	6,272,940
Monsanto Chemical Co.	15,561,228
Nopco Chemical Co.	694,737
Penick & Ford, Ltd.	3,338,035
Pittsburgh Plate Glass Co.	27,771,144
St. Joseph Lead Co.	12,537,761
Sharp & Dohme Inc.	3,289,000
Shell Union Oil Corp.	59,874,698
Standard Oil Co. (Indiana) and subsidiaries	94,880,715
Union Carbide and Carbon Corp. and subsidiaries	75,666,792
United Carbon Co.	3,159,138
United Chemicals Inc.	178,837
Victor Chemical Works	2,044,384

*After Taxes

Sonneborn Elects Sandke

Robert J. Sandke, placed in charge of West Coast sales of the White Oil & Petrolatum Division, L. Sonneborn Sons, Inc. He has been with the firm for 18 years.

COMPANIES

DIAMOND ALKALI has acquired from the owners of the Prior Chemical Co. all the outstanding capital stock of the Martin Dennis Co., manufacturers of

chromium chemicals, with plants at Newark and Kearney, N. J., and, while Martin Dennis will be operated as a subsidiary, its business will be integrated into the overall production program of Diamond Alkali.

The new production laboratories of the ATLANTIC REFINING CO., now being constructed on the outskirts of Dallas, Texas, will be completed and in operation this spring. These laboratories, when fully equipped, will represent an investment of about $2 million, and will greatly accelerate the company's long-established program directed toward increasing the recovery of crude oil from existing and new fields.

THE CALCO CHEMICAL DIVISION of the AMERICAN CYANAMID CO. has appointed D. M. Aumack to the newly created position of manager of the effluent department. Mr. Aumack will direct the operation of effluent and treatment facilities at all Calco plant sites.

B. F. GOODRICH CHEMICAL CO. has formed a department to handle the sales of new chemical products. Many of the products assigned to the new sales group will be manufactured in the recently announced $3,000,000 chemical plant to be built at Avon Lake, Ohio.

C. FRED GURNHAM, who has been associated with the Whitney Blake Co., of New Haven, Conn., has entered the consulting field as a chemical engineer with offices at 72 Lake Street, Hamden 14, Conn.

Reynolds Accepts Promotion

A. W. Reynolds, appointed assistant to the executive sales manager for Southern Alkali Corp. and the Columbia Chemical Division, Pittsburgh Plate Glass Co. He has been associated with Columbia Chemical since 1931.

The DU PONT CO. has started construction of a unit to manufacture a new insecticide at the Houston, Texas, works of its Grasselli Chemicals Department.

The new insecticide—benzene hexachloride—has proved effective on cotton, peaches and on certain vegetables, as well as on livestock and for the destruction of grasshoppers. Du Pont has been making it in limited quantities since 1946 and has marketed it under the trade-mark name of "Lexone".

PERSONNEL

Arnold, Hoffman & Co., Inc., has promoted EARLE D. MCLEOD to the post of assistant to the president. Mr. McLeod has been research director at Arnold, Hoffman since 1942. He is succeeded in that position by CHAUNCEY E. ALLARD, who previously acted as research supervisor.

DAVID N. HAUSEMAN, U. S. Army, retired, has been elected president of Houdry Process Corp., Philadelphia, to succeed Eugene J. Houdry, founder of the company. General Hauseman also will be chairman of the board of Catalytic Construction Co., subsidiary of Houdry.

Diamond Alkali Co. has appointed A. H. INGLEY as vice president in charge of operations for the company's 11 chemical plants throughout the country, and named M. O. KIRP to succeed him as general manager of the Painesville, Ohio, plant.

L. T. HUNDT, USN (Ret.) has been named general manager of the National Foam System, Inc., plant at West Chester, Pa., and E. P. HUGHES has been named assistant to the president.

H. G. BURKS, JR., a director of Esso Standard Oil Co. has been appointed general manager of the company's manufacturing operations, and H. W. FISHER, also a director, has been named to succeed him as general manager of East Coast refineries.

R. S. WOBUS, manager of the Monsanto Chemical Co. plant at Norfolk, Va., has been promoted to the newly-created position of assistant to the plant manager of the John F. Queeny Plant in St. Louis. He will be succeeded in Norfolk by JAMES H. ZWEMER, who has been assistant plant manager there.

ELLIOTT R. WEYER, associate director, Division of Patent Management, Research Corp. has joined the scientific staff of Chas. Pfizer & Co., Inc.

L. A. MASON has been appointed to head the Export Division of Sherwin-Williams' Pigment, Chemical & Color Department. He started with Sherwin-Williams in 1939 in the company's Industrial Sales Division, Cleveland.

ALLAN W. LOW has been named general superintendent of a new formaldehyde plant of Monsanto Chemical Co.'s Plastics Division. He has been employed by the General Chemical Division of Allied Chemical and Dye Corp. in manufacturing research and administrative capacities for the past 12 years.

CHEMICAL SPECIALTIES

A department devoted to news of the chemical specialties field. Descriptions of new specialty products will be found in the New Products & Processes department.

Non-Curling Carbon Tissue

The moisture resistance and flexibility of carbon paper tissue has been improved by the use of Vinylite plastic as a back coating to provide a product that will not curl even after considerable use. Swift insertion and extraction of the paper are simplified for the user because it does not curl over. The strength of the tissue has also been increased over one-third the value of ordinary tissue. In addition, the coating is receptive to the printing inks used to designate the various quality grades.

This new carbon paper is made by the Neidich Process Division of Underwood Corporation, New York, N. Y.

Walton to Head New Products Division

Dr. Charles W. Walton, chosen head of the new products division, Minnesota Mining & Manufacturing Co., St. Paul, Minn. His newly created division will develop new products, introduce them to markets, and then try to build markets to commercial proportions.

Registration of Economic Poisons

The Department of Agriculture has urged manufacturers of insecticides, fungicides, and disinfectants to register their products with the Department as speedily as possible. Registration is required under the Federal Insecticide, Fungicide, and Rodenticide Act for all economic poisons that are shipped in interstate commerce.

This law, already in effect for rodenticides and weed killers, becomes effective for insecticides, fungicides, and disinfectants on June 25, 1948. Registration is required by that date.

Officials of the Livestock Branch of the Production and Marketing Administration who administer the Act point out that labels now in use for economic poisons, and which comply with the Insecticide Act of 1910, may have to be changed to comply with the new law. Because of the time required to make changes, all labeling subject to the Act which has not already been registered should be submitted promptly for registration.

Urea Tested as Protein Extender

Extensive tests on urea as a possible extender of protein supplements in rations for cattle and sheep have been completed recently at Oklahoma A. and M.

In areas where grain is rich in carbohydrates but relatively poor in protein, urea mixed with blackstrap molasses, hominy feed and a limited amount of cottonseed meal in pellet form proved to be as good as cottonseed meal for a supplementary ration in most cases.

Nitrogen, necessary for maintenance and growth, can be utilized by most animals only when in a protein form. Cattle and sheep, unlike other animals, apparently are able to convert this non-protein nitrogen compound, urea, into protein in their rumen.

The kidneys of the slaughtered animals were examined later for damaged tissue, but in no case was evidence of toxicity found.

Toxaphene Use Extended

Three more crop-destroying pests have been added to the long list which can be effectively controlled by the new insecticide, Toxaphene, according to a preliminary report issued by the University of Delaware. Toxaphene is a technical grade of chlorinated camphene manufactured by Hercules Powder Co. for use in agricultural dusts and sprays.

Toxaphene shows considerable promise in the control of European red mite on apples, the armyworm, and the Mexican bean beetle, the report states. University-conducted tests also showed that Toxaphene can be

safely applied on 69 varieties of shade trees and ornamental shrubs.

The report points out that a 5 per cent Toxaphene dust concentrate is as effective as a 0.75 per cent rotenone dust concentrate against the Mexican bean beetle.

Egeler to Manage Sherwin-Williams Division

C. K. Egeler, named assistant manager of the New York Pigment, Chemical & Color Division, Sherwin-Williams Co. He has been a sales representative for the division.

To Form Cosmetic Library

The formation of a central library of books, periodicals and general information relating to the science and art of cosmetics and perfumery is envisaged by the Society of Cosmetic Chemists.

To bring this about, Dr. Walter A. Taylor, president of the society, has appointed a committee to investigate all the possibilities and facilities.

The scientific advances in the cosmetic industry since the passage of the Federal Food, Drug and Cosmetic Act, and the higher professional standards that have been developed by the Society of Cosmetic Chemists, have sharply focused attention on the need for such a centralized library.

The members of the present committee are: Chairman, Edward Sagarin, advertising manager, Givaudan-Delawanna, Inc.; Florence E. Wall, consulting chemist, author and lecturer, well-known in the industry; and Frederick J. Rowse, of the technical staff of Norda Essential Oil and Chemical Company.

Rohm & Haas Handles Boconize Sales

Rohm and Haas Company will handle sales of Boconize to textile mills in all the United States except New York and New England for the Bocon Chemical Corp.

Boconize is a durable textile mothproofing agent which it is claimed will withstand 5 launderings and 25 dry cleanings.

Chlordane Controls Mole-Crickets

The University of Florida Agricultural Experiment Station, Gainesville, Florida, has reported that tests on chlordane (a chlorinated hydrocarbon) show it to be effective against grasshoppers and locusts, and an excellent control for mole-crickets. Chlordane kills much faster than DDT does. Its success against the plague of grasshoppers on citrus has made it a popular insecticide in Florida, and adequate quantities are on the commercial market. It kills mole-crickets as effectively as DDT and acts much more rapidly.

It has not been possible, however, to complete studies on the possible cumulative effect of chlordane on plant life. In view of this, the Experiment Station does not recommend its use in mole-cricket control with the same assurance that it recommends DDT. It is believed that probably it will be as safe as DDT, since it is a more active material and probably will decompose or disappear more rapidly in the soil.

CHEMICAL MARKETS

Methanol Price Up

The four-cent increase a gallon in the price of methanol that the Du Pont Company put into effect April 1 reflects a general trend which started last September. Formaldehyde, of which methanol is a basic ingredient, was also advanced one-half cent per pound, while hexamethylene tetramine, technical grade, and paraformaldehyde were increased one and a half and one cent a pound respectively. These advances make the prices for methanol 28 cents per gallon east of the Rockies; for formaldehyde, 4.2 cents a pound for regular grade; for "hexa," 27.5 cents a pound; and for paraformaldehyde, 26 cents a pound.

Last September, Commercial Solvents Corp. increased its price of methanol from 24 to 27 cents a gallon, but at the present no further increase is contemplated. Celanese Corp. of America is maintaining the price of methanol in zone 2 at 27 cents a gallon, but the price of 33 cents a gallon in zones 3 and 4 (the west coast) represents a 4-cent increase. Formaldehyde was advanced one-half cent a pound April 1, making the price of the order of the new Du Pont figure. Heyden Chemical Corp. also upped its price of formaldehyde one-half cent a pound April 1. Union Carbide & Carbon Corp. at present plans no increase in its 27-cent-per-gallon price for methanol in zone 1. (All prices given are for tank car lots.)

Benzene Hexachloride May Be Short

The steady inquiry into the possibilities of benzene hexachloride may result in a shortage of this new insecticide before the consuming season is over. November production of 1,188,000 pounds probably indicates 1947 production in excess of 7 million pounds, about one-third of which was exported. The gamma isomer content of November output was 152,000 pounds.

Philippine Copra Factor in Oil Shortage

The most hopeful aspect of the world-wide shortage of fats and oils is the tremendous increase in the copra production of the Philippines. From shipments of only 6,000 long tons in 1945 and 600,000 in 1946, an all-time high of 1,000,000 tons was exported in 1947. This amount is in excess of the 1935-39 average exports by 80 per cent.

While the United States received only 60 per cent of this total as contrasted with 80 per cent that was our prewar share, our volume of imports was about 10 per cent higher than prewar. Europe received 30 per cent of this tremendous production.

In Europe coconut oil finds use as a food to help ease the shortage of edible fats and oils in that area. The cake which is the byproduct of the crushing process has been useful in making up European deficiencies of livestock feed.

The United States has used coconut oil mainly as a soap fat. In serving this function it has alleviated the pressure on edible fats that might have had to serve for such purposes.

Phenol, Phthalic Anhydride Outlook Dim

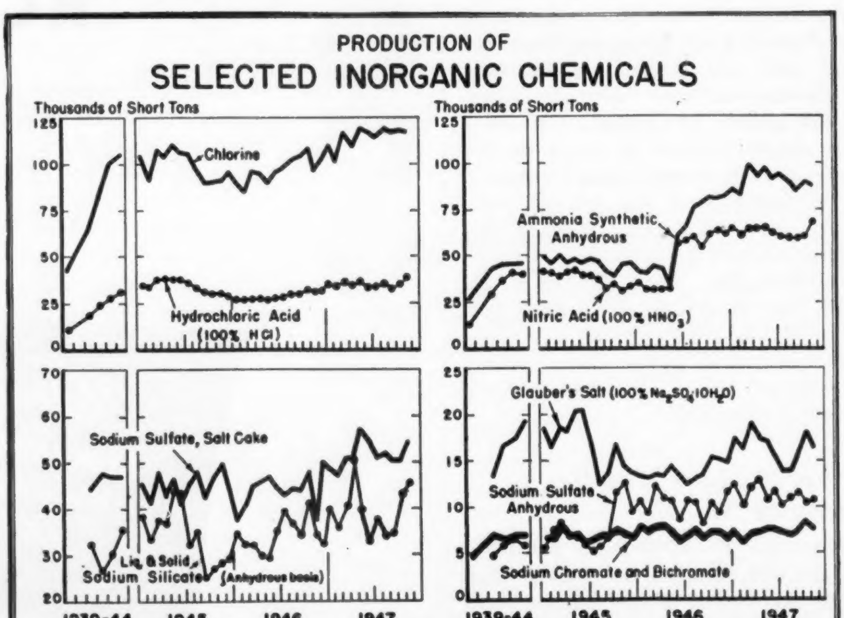
Both phenol and phthalic anhydride, two of the more important cyclic intermediates, continue to be in shortest supply. November production of phenol was 23,825,000 pounds as contrasted with November, 1946 production of 18,307,000 pounds; for phthalic anhydride, output for the same periods was 12,373,000 and 11,246,000 pounds. There is no prospect for any let-up in domestic or foreign demand.

Solid Nitrogen Fertilizers To Remain Short

The production figures for solid ammonium nitrate fertilizer may reflect changes wrought by the disastrous Grandcamp explosion at Texas City on April 16, 1947, and the subsequent one at Brest. During the first 5 months of the 1947-48 fertilizer year, total ammonium nitrate production was 344,868 tons. Comparable monthly figures for 1946-47 are not available. However, estimates place last year's output at 67,000 tons a month, while this year's is just under 69,000 tons. This increase is apparently all in the form of solutions since 1947-48 output of solid ammonium nitrate fertilizer is expected to be nearly 7 per cent less than that of 1946-47.

At least one major supplier has increased ammonia oxidation facilities to permit increased expansion of its nitrogen solution fertilizer business. All have their eyes on the increased use of anhydrous ammonia for direct application to the soil. This has apparently proved a success, for millions of acres are expected to be fertilized this way in 1948 as contrasted with a reported 200,000 acres thus fertilized in 1947.

The increased popularity of this method may have been enhanced by the shortage of solid nitrogenous materials. Forecasts of the Department of Agriculture indicate that 2 per cent less solid nitrogen will be available during 1947-48 than last year. However, the higher rate of ammonium sulfate production and early arrivals of Chilean nitrate should ease the situation for early buyers.



CURRENT PRICES

Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f.o.b. works are specified as such. Import chemicals are so designated.

Oils are quoted spot New York, ex-dock. Quotations f.o.b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York, f.o.b., or ex-dock. Materials sold f.o.b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both.

Purchasing Power of the Dollar: 1926 Average—$1.00
March, 1946, $0.767 *March, 1947, $0.601*
March, 1948, $0.581

	Current		1948		1947	
	Low	High	Low	High	Low	High
Acetaldehyde, 99%, drs wks ....lb.	.11	.12	.11	.12	.11	.15
Acetic Anhydride, drs, c.l., frt. all. E. ....lb.	.13	.14½	.13	.14½	.11½	.14½
Acetone, tks, delv ....lb.	.07	.09	.07	.09	.07	.09
ACIDS						
Acetic, 28% bbls .....100 lbs.	3.78	4.08	3.78	4.08	3.38	4.08
Glacial, synthetic C. P., drs, wks ......100 lbs.	13.50	14.00	13.50	14.00	13.50	14.00
Acetylsalicylic, Standard USP ....lb.	.45	.59	.45	.59	.45	.59
Benzoic, tech, bbls........lb.	.43	.47	.43	.47	.43	.47
USP, bbls, 4,000 lbs up.lb.	....	.54	....	.54	....	.54
Boric tech, bbls, c-l, frt. split .... tons	....	124.00	....	124.00	....	124.00
Chlorosulfonic, drs, wks..lb.	.03	.04½	.03	.04½	.03	.04½
Citric, USP, crys, gran, bbls .... lb. *b*	.22	.23	.22	.23	.20	.23
Cresylic 50%, 210-215° low boil 50%, drs, wks, frt, equal ....gal.	1.26	1.48	1.26	1.48	1.01	1.26
Formic, 85%-90% cbys ...lb.	.12	.14½	.12	.14½	.10	.14½
Hydrofluoric, 30% steel, drs .... lbs.	.08	.09	.08	.09	.08	.09
Lactic, 22%, bbls, c.l., wks .... 100 lbs.	....	4.40	....	4.40	....	4.40
44%, light, bbls, wks....lb.	8.15	8.55	8.15	8.55	.073	8.55
Maleic, Anhydride, drs....lb.	.25	.26	.25	.26	.25	.26
Muriatic 18° cbys.....100 lbs.	1.50	2.90	1.50	2.90	1.50	2.90
20° cbys, c-l, wks...100 lbs.	1.85	2.00	1.85	2.00	1.85	2.00
22° cbys, c-l, wks...100 lbs.	2.35	2.50	2.35	2.50	2.35	2.50
Nitric, 36°, cbys, wks.100 lbs. *c*	5.00	6.30	5.00	6.30	5.00	6.30
38°, c-l, cbys, wks.100 lbs. *c*	2.35	5.50	2.35	5.50	....	5.50
40°, c-l, cbys, wks.100 lbs. *c*	6.00	6.50	6.00	6.50	....	6.50
42°, c-l, cbys, wks.100 lbs. *c*	6.50	7.00	6.50	7.00	....	7.00
Oxalic, bbls, wks..........lb.	.13	.14	.13	.14	.11¾	.14
Phosphoric, 100 lb. cbys, USP ....lb.	.10½	.13	.10½	.13	.10½	.13
Salicylic tech, bbls........lb.	.31	.38	.31	.38	.26	.42
Sulfuric, 60°, tks, wks....ton	12.25	13.50	12.25	13.50	....	13.50
66°, tks, wks ....ton	15.00	17.50	15.00	17.50	....	17.50
Fuming 20% tks, wks...ton	19.50	20.50	19.50	20.50	....	20.50
Tartaric, USP, bbls........lb.	.41½	.50	.41½	.50	.49½	.55
Alcohol, Amyl (from Pentane) tks, delv ....lb.	....	.25	....	.25	....	.25
Butyl, normal, syn, tks.lb.	....	.17	....	.17	....	.17
Denatured, CD, proprietary solvent .... gal. *d*	1.00½	1.03	1.00½	1.03	1.00½	1.03
Ethyl, 190 proof tks....gal.	18.04	18.13	18.04	18.13	18.04	18.08
Isobutyl, ref'd, drs......lb.	....	.13	....	.13	....	.13
Isopropyl ref'd, 91% drms .... gal.	.44	.50½	.44	.50½	.41	.50½
Alum, ammonia, lump, bbls, wks ....100 lbs.	....	4.25	....	4.25	....	4.25
Aluminum, 98.99%....100 lbs.	15.00	16.00	15.00	16.00	15.00	16.00
Chloride anhyd, l.c.l. wks lb.	....	.10¼	....	.10¼	....	.10¼
Hydrate, light, bgs.......lb.	....	.17	....	.17	....	.17
Sulfate, com'l. bgs, wks, c-l .... 100 lbs.	1.15	1.30	1.15	1.30	1.15	1.30
Sulfate, iron-free, bgs, wks .... 100 lbs.	1.95	2.25	1.95	2.25	1.75	2.50
Ammonia anhyd. cyl......lb.	.16	....	.16	....	.14½	.20
Ammonia, anhyd, frt, tank cars, wks, frt, equalized.ton	....	59.00	....	59.00	....	59.00
Ammonium Carbonate, USP lumps, drs ....lb.	.08¼	.19	.08¼	.19	.08¼	.19
Chloride, USP bbls, drms, kgs .... lb.	.13	.15	.13	.15	.13	.15
Nitrate, tech, bgs, wks...lb.	.0435	.0450	.0435	.0450	.0435	.0450
Oxalate pure, grn, bbls..lb.	.23	.29	.23	.29	.23	.29
Perchlorate, kgs ....lb.	.25	....	.25	....	.24	.25
Phosphate, dibasic tech, bgs .... lb.	.07	.07¾	.07	.07¾	.07	.07¾
Stearate, anhyd, drs....lb.	....	.34	....	.34	....	.34
Sulfate, drs, bulk.......ton	30.00	40.00	30.00	40.00	30.00	38.00

USP $25 higher; Prices are f.o.b. N. Y., Chicago, St. Louis, deliveries ½c higher than NYC prices, *a* Powdered boric acid $5 ton higher; *b* Powdered citric acid is ½c higher; *c* Yellow grades 25c per 100 lbs. less in each case; *d* Prices given are Eastern schedule.

Current Prices

Amyl Acetate Gums

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Amyl Acetate (from pentane) tks, delv ....lb.	.21	.29	.21	.29	.21	.24
Aniline, Oil, drs ....lb.	.13	.15	.13	.15	.12	.14
Anthraquinone, sub, bbls..lb.	....	.70	....	.70	....	.70
Antimony Oxide, bgs......lb.	.26	.27½	.26	.27½	.21	.31
Arsenic, whl, bbls, powd...lb.	.06	.08	.06	.08	.05	.08
Barium Carbonate precip, wks, bgs ....ton	67.50	82.00	67.50	82.00	60.00	82.00
Chloride, tech, cryst, bgs, zone 1 ....ton	85.00	95.00	85.00	95.00	73.00	95.00
Barytes, floated, paper bgs.ton	no prices		no prices		....	41.95
Bauxite, bulk mines ......ton	8.50	10.00	8.50	10.00	7.00	10.00
Benzaldehyde, tech, cbys, drs ....lb.	.45	.55	.45	.55	.45	.55
Benzene (Benzol), 90%, tks, frt all'd ....gal.	.19	.21	.19	.21	.19	.21
Benzyl Chloride, cbys .....lb.	.20	.28	.20	.28	.20	.28
Beta-Naphthol, tech, bbls, wks ....lb.	.23	.29	.23	.29	.21	.29
Bismuth metal, ton lots....lb.	....	2.00	....	2.00	....	2.00
Blanc Fixe, 66⅔ Pulp, bbls, wks ....ton	55.00	65.00	55.00	65.00	40.00	60.00
Bleaching Powder, wks ....100 lbs.	2.75	3.75	2.75	3.75	2.50	3.75
Borax, tech, c-l, bgs......ton	53.50	56.00	53.50	56.00	45.00	56.00
Bordeaux Mixture, bgs ....lb.	.15	.23	.15	.23	.11	.23
Bromine, cases ....lb.	.21	.23	.21	.23	.21	.23
Butyl, acetate, norm, drs...lb.	.30½	.36½	.30½	.36½	.26	.33½
Cadmium Metal ....lb.	1.75	1.80	1.75	1.80	....	1.80
Calcium, Acetate, bgs.100 lbs.	3.00	4.00	3.00	4.00	3.00	4.00
Carbide, drs ....ton	50.00	90.00	50.00	90.00	50.00	90.00
Chloride, flake, bgs, c-l..ton	21.50	38.00	21.50	38.00	18.50	38.00
Solid, 73-75% drs, c-l...ton	20.00	37.50	20.00	37.50	18.00	37.50
Gluconate, USP, bbls....lb.	.58	.65	.58	.65	.57	.65
Phosphate tri, bbls, c-l...lb.	6.50	6.80	6.50	6.80	6.50	6.80
Camphor, USP, gran, powd, bbls, 2,000-lb. lots.......lb.	.66	.78	.66	.78	.75	.82
Carbon Bisulfide, 55-gal. drs ....lb.	.05	.05¾	.05	.05¾	.05	.05¾
Dioxide, cyl ....lb.	.06	.08	.06	.08	.06	.08
Tetrachloride, Zone 1, 52½ gal. drs ....lb.	.06½	.07	.06½	.07	.06	.07
Casein, Acid Precip, bgs, 10,000 lbs. or more......lb.	.30	.35	.30	.35	.26	.35
Chlorine, cyls, lcl, wks, contract ....lb.	.09	.15½	.09	.15½	.08¾	.10½
Liq, tk, wks, contract ....100 lbs.	....	2.25	....	2.25	....	2.30
Chloroform, tech, drs .....lb.	.20	.23	.20	.23	.20	.23
Coal tar, wks, crude, dms, c-l, wks ....dm.	....	10.60	....	10.60	....	10.60
Cobalt, Acetate, bbl.......lb.	....	.83¾	....	.83¾	....	.83¾
Oxide, black kgs ....lb.	1.275	1.80	1.275	1.80	....	1.30
Copper, metal ....100 lbs.	....	21.50	....	21.50	21.50	24.00
Carbonate, 52-54%, bbls..lb.	.24	.26	.24	.26	.19½	.26½
Sulfate, bgs, wks cryst. ....100 lbs.	7.60	8.00	7.60	8.00	7.10	8.60
Copperas, bulk, c-l, wks...ton	....	14.00	....	14.00	....	14.00
Cresol, USP, drs ....lb.	.14	.17¼	.14	.17¼	.13¾	.15¾
Dibutylamine, c-l, drs, wks.lb.	.52½	.76	.52½	.76	....	.76
Dibutylphthalate, drs......lb.	.32	.38½	.32	.38½	.29	.38½
Diethylaniline, drs ....lb.	....	.48	....	.48	....	.48
Diethylene glycol, drs, wks.lb.	.14	.15	.14	.15	.14	.15
Dimethylaniline, drs, cl., lcl ....lb.	.21	.24¼	.21	.24¼	.20	.24¼
Dimethylphthalate, drs ....lb.	.23½	.27½	.23½	.27½	.20	.24¾
Dinitrobenzene bbls ....lb.	....	.16	....	.16	....	.16
Dinitrochlorobenzene, dms..lb.	.14	.15½	.14	.15½	.14	.15½
Dinitrophenol, bbls........lb.	....	.26¾	....	.26¾	....	.22
Dinitrotoluene, refd., drs...lb.	....	.18	....	.18	....	.18
Diphenyl, bbls, lcl, wks....lb.	.15	.20	.15	.20	.15	.20
Diphenylamine, bbls ......lb.	....	.25	....	.25	....	.25
Diphenylguanidine, drs ....lb.	.35	.37	.35	.37	.35	.37
Ethyl Acetate syn. 85-90%, tks, frt. all'd ....lb.	.09½	.13½	.09½	.13½	.09½	.12
Chloride, USP, bbls .....lb.	.20	.22	.20	.22	.18	.22
Ethylene Dichloride, lcl, wks, E. Rockies, drs ......lb.	.08½	.09½	.08½	.09½	.08½	.09½
Glycol, dms, cl ....lb.	....	.13½	....	.13½	....	.12
Fluospar, No. 1, grd. 95-98% bulk, c-l mines ......ton	....	37.00	....	37.00	....	37.00
Formaldehyde, bbls, cl & lcl ....lb.	.0645	.0745	.0645	.0745	.0520	.0745
Furfural tech, tks.........lb.	....	.09½	....	.09½	....	.13
Fusel Oil, ref'd, drs, dlvd..lb.	.26½	.29½	.26½	.29½	.18½	.29½
Glauber's Salt, Cryst, bgs, wks ....100 lbs.	1.25	1.75	1.25	1.75	1.05	1.75
Glycerine dynamite, drs, c-l.lb.	.39½	.40¼	.39½	.40¼	.29½	.75¾
Crude Saponification, 88% to refiners tks ....lb.	.23	.32	.23	.32	.23	.60

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
GUMS						
Gum Arabic, amber sorts bgs ....lb.	.14	.15	.14	.15	.13¾	.15
Benzoin, Sumatra, cs......lb.	.48	.60	.48	.60	.50	1.00
Copal, Congo No. 1, bgs...lb.	.26	.29	.26	.29	.26	.29
Copal, East India, chips...lb.	no prices		no prices		no prices	
Macassar DBB, bgs......lb.	.24	.25	.24	.25	.24	.25
Copal Manila ....lb.	no prices		no prices		.25	....
Karaya, bbls, bxs, drs.....lb.	.20	.51	.20	.51	.20	.55

ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys, cbys; carlots, c-l; less than carlots, lcl; drums, drs; kegs, kgs; powdered, powd; refined, ref'd; tanks, tks; works, f.o.b., wks.

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Kauri, N. Y.						
Superior Pale XXX......lb.	no prices		no prices		....	nom.
bgs ....lb.		.31		.31	....	.31
Sandarac, cks ....lb.	.95	1.50	.95	1.50	.85	1.00
Tragacanth, No. 1, cases...lb.	3.60	8.70	3.60	8.70	3.60	8.70
No. 3 ....lb.	2.00	2.50	2.00	2.50	2.00	3.45
Yacca, bgs ....lb.	.06	.07	.06	.07	.06	.07
Hydrogen Peroxide, cbys...lb.	.15½	.18½	.15½	.18½	.15½	.18½
Iodine, Resublimed, jars...lb.	2.35	2.65	2.35	2.65	....	2.65
Lead Acetate, cryst, bbls..lb.	....	.19¼	....	.19¼	....	.19¼
Arsenate basic, bg, lcl....lb.	.22¾	.23¾	.22¾	.23¾	....	.23¾
Nitrate, bbls ....lb.	.17¾	.18	.17¾	.18	....	.18
Red, dry, 95% Pb^3O^4						
bbls ....lb.	.17½	.18½	.17½	.18½	.14¼	.19¼
97% Pb^3O^4, bbls, delv..lb.	.17½	.18¾	.17½	.18¾	.15	.19½
98% Pb^4O^4, bbls, delv..lb.	.18	.19	.18	.19	.15¼	.19¾
White, bbls ....lb.	.16	.16¼	.16	.16¼	.13	.17¾
Basic sulfate, bbls, lcl.lb.	.15¼	.15½	.15¼	.15½	.12½	.15½
Lime, Chem., wks, bulk...ton	6.50	10.25	6.50	10.25	6.50	10.25
Hydrated, f.o.b. wks ...ton	8.00	12.14	8.00	12.14	8.00	12.14
Litharge, coml, delv, bbls..lb.	.1660	.17½	.1660	.17½	.13	.17½
Lithopone, ordi., bgs.......lb.	.05½	.06	.05½	.06	.03	.06
Magnesium Carb, tech, wks.lb.	.07¼	.10¾	.07¼	.10¾	.07¼	.10¾
Chloride flake, bbls, wks						
c-l ....ton	....	40.00	....	40.00	....	37.00
Manganese Chloride, Anhyd.						
bbls ....lb.	.12¾	.16	.12¾	.16	.14	.16
Dioxide, Caucasian bgs,						
lcl ....ton	74.75	79.75	74.75	79.75	74.75	79.75
Methanol, pure, nat, drs.gal. *l*	.63	.73	.63	.73	.63	.73
Synth, drs cl.........gal *m*	.34½	.41½	.34½	.41½	.31	.41½
Methyl Acetate, tech tks...lb.	.06	.07	.06	.07	.06	.07
C. P. 97-99%, tks, delv.lb.	.09½	.12	.09½	.12	.09½	.10½
Chloride Indust., cycl,						
wks ....lb.	.16	.41	.16	.41	.32	.41
Ethyl Ketone, tks, frt						
all'd ....lb.	....	.12½	....	.12½	....	.09
Naphtha, Solvent, tks ....gal.	....	.28	....	.28	....	.28
Naphthalene, crude, 74°, wks.						
tks ....lb.	.04½	.05¾	.04½	.05¾	.035	.083
Nickel Salt, bbls, NY.....lb.	.14	.14½	.14	.14½	.14	.14½
Nitre Cake, blk ....ton	20.00	24.00	20.00	24.00	....	24.00
Nitrobenzene, drs, wks.....lb.	.08½	.10	.08½	.10	.08	.09½
Orthoanisidine, bbls ......lb.	....	.80	....	.80	....	.70
Orthochlorophenol, drs.....lb.	....	.37	....	.37	.25	.37
Orthodichlorobenzene, drs..lb.	.07½	.10½	.07½	.10½	.07	.10½
Orthonitrochlorobenzene,						
wks ....lb.	.15	.18	.15	.18	.15	.18
Orthonitrotoluene, wks,						
drs ....lb.	.08	.09	.08	.09	.08	.09
Paraldehyde, 98%, wks lcl..lb.	.12½	.13½	.12½	.13½	.22	.13½
Chlorophenol, drs ....lb.	.25	.29	.25	.29	.24	.29
Dichlorobenzene, wks ...lb.	.12½	.14	.12½	.14	.12½	.14
Formaldehyde, drs, wks..lb.	.21	.23	.21	.23	....	.22
Nitroaniline, wks, kgs...lb.	.41	.43	.41	.43	.41	.43
Nitrochlorobenzene, wks..lb.	....	.18	....	.18	....	.18
Toluenesulfonamide, bbls.lb	....	.70	....	.70	....	.70
Toluidine, bbls, wks.....lb.	.44	.53	.44	.53	....	.53
Penicillin, ampules per						
100,000 units, bulk	.14	.19	.14	.19	.14	.38
Pentaerythritol, tech ....lb.	.32	.36	.32	.36	.27	.36

PETROLEUM SOLVENTS AND DILUENTS

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Lacquer diluents, tks,						
East Coast ....gal.	.13	.16	.13	.16	....	.14
Naphtha East,						
tks, wks ....gal.	.11	.14	.11	.14	....	.11
Rubber solvents, East, tks,						
wks ....gal.	.12½	.13	.12½	.13	....	.12
Stoddard Solvents, East,						
tks, wks ....gal.	.11½	.14	.11½	.14	....	.12

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Phenol, U.S.P., drs ......lb.	.11¼	.13¼	.11¼	.13¼	.11¼	.13¼
Phthalic Anhydride, cl and lcl,						
wks ....lb.	.14½	.20	.14½	.20	.14½	.17½
Potash, Caustics, 88-92%,						
wks, sol ....lb.	.06¾	.07½	.06¾	.07½	.06¼	.07½
Flake, 88-92% ....lb.	.07½	.08¼	.07½	.08¼	.07	.08¼
liquid, 45% basis, tks..lb.	....	.03½	....	.03½	....	.03½
ds, wks ....lb.	.0337½	.0375	.0337½	.0375	.03¼	.04
Carbonate hydrated						
83-85%, bbls ....lb.	.05¾	.06	.05¾	.06	.06	.05¾
Chlorate crys, kgs, wks..lb.	.08½	.09¾	.08½	.09¾	.08½	.13
Chloride, USP, cryst,						
bbls ....lb.	.21	.22	.21	.22	.21	.22
Cyanide, drs, wks ....lb.	....	.55	....	.55	....	.55
Iodide, drs ....lb.	1.95	1.98	1.95	1.98	1.44	1.98
Muriate dom, 60-62-63%						
K^2O bulk unit-ton	.37½	.53½	.37½	.53½	.37½	.53½
Permanganate, USP, wks						
drs ....lb.	.22½	.24	.22½	.24	.20½	.23
Sulfate, 90%, basis, bgs.ton	36.25	39.25	36.25	39.25	36.25	39.25
Propane, group 3, tks.....gal.	.03½	.06¾	.03½	.06¾	.03½	.06¾
Pyridine, reg., drs ....lb.	.60	.69	.60	.69	.55	.65
R Salt, 250 lb bbls, wks....lb.	.61	.72	.61	.72	....	.72
Resorcinol, tech. drs, wks..lb.	....	.68	....	.68	.64	.74
Rochelle Salt, cryst........lb.	.31½	.35	.31½	.35	.32½	.35
Salt Cake, dom, blk wks...ton	20.00	26.00	20.00	26.00	....	26.00
Saltpeter, grn, bbls....100 lbs.	8.00	9.50	8.00	9.50	8.20	9.50

l Producers of natural methanol divided into two groups and prices vary for these two divisions; *m* Country is divided into 4 zones, prices varying by zone. Spot price is ½c higher.

Current Prices — Oils & Fats, Shellac

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Shellac, blchd, bone dry, bbls ....lb.	.58½	.77	.58½	.77	.58½	.74½
Silver Nitrate, bots, 2,500-oz. lots ....oz.	.42¼	.48	.42¼	.48	.42¼	.59
Soda Ash, 58% dense, bgs, c-l, wks ....100 lbs.	....	1.38	....	1.38	....	1.38
58% light, bgs cl..100 lbs.	....	1.30	....	1.30	....	1.30
Caustic, 76% flake drs, cl ....100 lbs.	....	3.25	....	3.25	2.90	3.25
76% solids, drs, cl.100 lbs.	....	2.85	....	2.85	2.50	2.85
Liquid, 47-49%, sellers, tks ....100 lbs.	....	2.10	....	2.10	....	2.10
Sodium Acetate, anhyd. drs ....lb.	.06½	.11	.06½	.11	.06½	.11
Benzoate, USP drs ....lb.	.46	.52	.46	.52	.46	.52
Bicarb, USP, gran., bgs, cl., works ....100 lbs	....	2.25	....	2.25	2.25	2.59
Bichromate, bgs, wks l.c.l. ....lb.	.08¾	.09¾	.08¾	.09¾	.07⅞	.09¾
Bisulfate powd, bbls, wks ....100 lbs.	3.00	3.60	3.00	3.60	3.00	3.60
35° bbls, wks ....100 lbs.	1.40	1.65	1.40	1.65	1.40	1.65
Chlorate, kgs, wks cl....lb.	....	.07¼	....	.07¼	....	.06¾
Cyanide, 96-98%, drs....lb.	.14½	.15	.14½	.15	.14½	.15
Fluoride, 95%, bbls, drs..lb.	.09¾	.10	.09¾	.10	.07¼	.10
Hyposulfite, cryst, bgs, cl, wks ....100 lbs.	....	2.75	....	2.75	....	2.75
Metasilicate, gran, bbl, wks c-l ....100 lbs.	3.25	3.40	3.25	3.40	....	3.40
Nitrate, imp, bgs, c.l....ton	....	48.00	....	48.00	....	42.50
Nitrite, 96-98% bbl, cl...lb.	....	.06¾	....	.06¾	....	.06¾
Phosphate, dianhyd. bgs, wks ....100 lbs.	6.25	7.00	6.25	7.00	6.00	7.00
Tri-bgs, cryst, wks ....100 lbs.	3.40	3.90	3.40	3.90	2.70	3.90
Prussiate, yel. bbls. wks..lb.	.12	.12¼	.12	.12¼	....	.12¼
Silicate, 52°, drs, wks 100 lbs.	1.55	2.00	1.55	2.00	1.40	2.00
40°, drs, wks, c-l..100 lbs.	.95	1.15	.95	1.15	....	1.15
Silicofluoride, bbls, NY..lb.	.06¼	.08½	.06¼	.08½	.06¼	.08½
Sulfate tech, Anhyd, bgs ....100 lbs.	2.10	2.60	2.10	2.60	1.70	2.60
Sulfide, cryst c-l, bbls, wks ....100 lbs.	....	3.75	....	3.75	....	3.00
Solid bbls, wks ....lb.	3.50	5.50	3.50	5.50	3.05	5.50
Starch, Corn, Pearl bgs ....100 lbs.	6.37	7.17	6.37	7.17	4.99	7.17
Potato, bgs, cl ....lb.	.0875	.1180	.0875	.1180	.0875	.1075
Rice, bgs ....lb.	no stocks		no stocks		no stocks	
Sweet Potato, bgs....lb.	no stocks		no stocks		no stocks	
Sulfur, crude, mines.....ton	16.00	18.00	16.00	18.00	16.00	18.00
Flour, USP, precp, bbls, kgs ....lb.	.18	.30	.18	.30	.18	.36
Roll, bbls, ...100 lbs.	2.45	3.40	2.45	3.40	2.65	3.40
Sulfur Dioxide, liquid, cyl..lb.	....	.09	....	.09	.07	.095
tks, wks ....lb.	.04½	.05	.04½	.05	....	.044
Talc, crude, c-l, NY ....ton	....	15.00	....	15.00	....	15.50
Ref'd, c-l, NY ....ton	14.50	24.50	14.50	24.50	14.50	24.50
Tin, crystals, bbls, wks....lb.	.55	.67	.55	.67	....	.60
Metal ....lb.	....	.91	....	.91	....	.80
Toluol, drs, wks....gal.	.28	.37	.28	.37	.28	.29½
tks, frt all'd....gal.	....	.23	....	.23	....	.23
Tributyl Phosphates, drs, lcl, frt all'd ....lb.	.66	.72	.66	.72	....	.72
Trichlorethylene, drs, wks.lb.	.09¼	.10½	.09¼	.10½	.08	.10½
Tricresyl phosphate tks....lb.	.32¼	.36	.32¼	.36	.32¼	.33
Triethylene glycol, drs.....lb.	.18½	.19½	.18½	.19½	.18½	.19½
Triphenyl Phos., bbls......lb.	.26	.29	.26	.29	.26	.32
Wax, Bayberry, bgs....lb.	no stocks		no stocks		no stocks	
Bees, bleached, U.S.P. cakes ....lb.	.65	.73	.65	.73	.68	.73
Candelilla, bgs, crude....lb.	.61	.65	.61	.65	.62	.80
Carnauba No. 1, Yellow, bgs, ton ....lb.	1.30	1.55	1.30	1.55	1.30	2.00
Xylol, Indus., frt all'd, tks wks ....gal.	.23	.30	.23	.30	....	.23
Zinc Chloride tech, fused, wks .)....lb.	.0625	.0655	.0625	.0655	.05	.0655
Oxide, Amer., bgs, wks...lb.	.08½	.10	.08½	.10	.09	.10
Sulfate, crys, bgs....100 lbs.	4.15	4.90	4.15	4.90	3.40	4.90

OILS AND FATS

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Babassu, tks ....lb.	.14½	.28½	.14½	.28½	.14½	.27½
Castor, No. 3, drs, c.l.....lb.	.20½	.34¼	.26½	.34¼	.27¾	.34¾
China Wood, drs, spot NY..lb.	.25¾	.27	.25¾	.27	.24	.41
Coconut, edible, drs Atlantic ports ....lb.	.18	.27	.18	.27	.18	.37
Corn, crude, tks, wks......lb.	....	.32	....	.32	....	.31
Linseed, Raw, drs. c.l......lb.	.2930	.3430	.2930	.3430	.3160	.3960
Menhaden, crude tks..........	.19	.22	.19	.22	.19	.22
Light, pressed, drs l.c.l...lb.	.16	.26	.16	.26	.16	.29
Palm, Niger, dms ....lb.	no prices		no prices		no prices	
Peanut, crude, tks, f.o.b. wks ....lb.	.17	.30	.17	.30	.20	.37
Perilla, crude, dms, NY....lb.	no stocks		no stocks		no stocks	
Rapeseed, bulks ....lb.	no prices		no prices		no prices	
Red, dms ....lb.	.17¾	.33¾	.17¾	.33¾	.17¾	.33¾
Soy Bean, crude, tks, wks..lb.	.15½	.29¾	.15½	.29¾	.15¼	.33
Tallow, acidless, dms......lb.	.19½	.35	.19½	.35	.19½	.35

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1	½	1800	T.E.N.V.
3	1	1200	T.E.
1	1	1200	X.P.
1	1	1800	220 V.—X.P.
2	1½	1200	T.E.
3	1½	1800	T.E.
1	1½	1800	X.P.
2	1½	3600	T.E.
6	2	1200	T.E.F.C.
1	2	1800	X.P.
1	2	1800	Open
3	2	3600	T.E.F.C.
2	3	1200	X.P.
2	3	1800	T.E.F.C.
3	3	3600	T.E.F.C.
1	5	1200	X.P.
6	5	1200	T.E.F.C.
1	7½	1200	T.E.F.C.
1	7½	1200	X.P.

1/60/110/220 VOLTS

Quan.	H.P.	Speed	Remarks
7	1	1200	T.E.
3	1½	1800	X.P.
1	2	1200	Open
1	3	1800	Open

NEW GEAR MOTORS

3/60/220/440 volts

Quan.	H.P.	Output RPM	Remarks
1	¼	96	440 V—Open
1	1/3	72	440 V—Open
1	½	86.2	Open
1	½	290	Open
1	1	45	Open
1	2	98.9	Open

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Quan.	H.P.	Output RPM	Remarks
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SYNTHETIC FUELS

(*Continued from page 577*)

200 to 400 barrels of oil a day depending on the coal used. Initially western coals, which lend themselves well to the hydrogenation process, will be employed to allow the best conditions for ironing out operating difficulties. Thereafter typical coals from all sections of the country, including bituminous and subbituminous, as well as lignite, will be the raw materials.

In general, the plant follows German design, but many improvements have been incorporated. These are use of automatic control instead of hand control to give greater throughput and trouble-free operation, the use of gases from the plant and the direct gasification of coal to furnish hydrogen instead of the costly manufacture of hydrogen from coke, and the very efficient utilization of heat through heat exchange between the outgoing hot products and the incoming cold raw materials. If these modifications work out, the result will be an increase in the thermal efficiency of the hydrogenation process from about 30 per cent to 50 per cent. This will mean cheaper gasoline and oil from this method. The Research and Development Branch at Bruceton, Pennsylvania has been concerned with more fundamental changes. Dry hydrogenation of the coal is being attempted to eliminate the steps of paste-preparation and recycling of oil Catalysts that will permit operation at lower pressures are being sought, particularly for production of fuel oil.

The requirements of a coal for the hydrogenation process are high volatility and low ash content, as the yield of liquid oil decreases with decrease in volatile matter. Most of the high-volatile bituminous coals, subbituminous coals, and lignites of the United States are suitable even if the ash runs high. A washing process separates the ash-bearing portion for steam and power requirements of the plant, while the low-ash portion is liquefied.

Fields in Ohio, Indiana, Kentucky, Illinois, Pennsylvania, West Virginia and other Eastern states are suitable. West of the Mississippi River utilization of the subbituminous coals of Wyoming, Colorado, New Mexico, Utah, and Montana and the lignites of the Dakotas, Montana, and Texas would be most wise. The tendency of these coals to slack and break down on exposure to air poses problems of preservation in shipment and storage that conversion to liquid fuels would eliminate. These poorer grades yield less oil. Bureau of Mines assay work shows that 0.5 ton of high-grade bituminous coal is required for the production of 1 barrel of oil, while for subbituminous, the requirement is 0.9 ton and for lignite, 1.2 tons.

The same considerations of water availability that are encountered with the Fischer-Tropsch process hold here. Site selection will be based on a solution of the problem of raw material costs versus transportation costs in any given set of conditions.

In addition to coal, natural gas may become an important raw material. Approximately 50 per cent of the cost of fuel from hydrogenation at the present time is the cost of the hydrogen. Natural gas at 5 cents per thousand cu. ft. instead of coal at $3 a ton could be used as a source of hydrogen to reduce this cost by two thirds, as well as to allow for savings in the capital investment and operating costs of a hydrogenation plant. Since the quantity of natural gas required to make the hydrogen is small in comparison to the amount of oil produced (6 to 8 per cent by weight of the product), such practice would make large quantities of liquid fuel available from a relatively small amount of natural gas. The requirement that natural gas be near or be easily piped to coal fields would be met in areas of Wyoming, Illinois, and Texas.

Data from Germany on the costs of the hydrogenation process reflect the urgency of wartime development and construction, and hence are not very reliable without more complete analysis than has yet been given them. However, work has progressed sufficiently well in this country to allow an accurate estimate of capital investment costs of $10,700 per barrel day. In general, production costs of aviation gasoline would run from 14 cents to 19 cents a gallon as contrasted with present cost of motor gasoline from petroleum of about 9 cents. If analysis showed that the use of natural gas for the necessary hydrogen were advisable, reduction of both capital investment and cost of production of gasoline would follow.

FUTURE PROGRAM

The tremendous industrial expansion of the United States since the war has created a demand for petroleum products that can no longer be met by domestic reserves. This is reflected by a change in the role of this country from a large exporter to a small net importer of petroleum, and a gradual shifting of the world's production center to the Middle East. While continued exploration will likely maintain our present production for some time, it is apparent that development of a synthetic fuels industry is the only solution that will provide us with economic and military security.

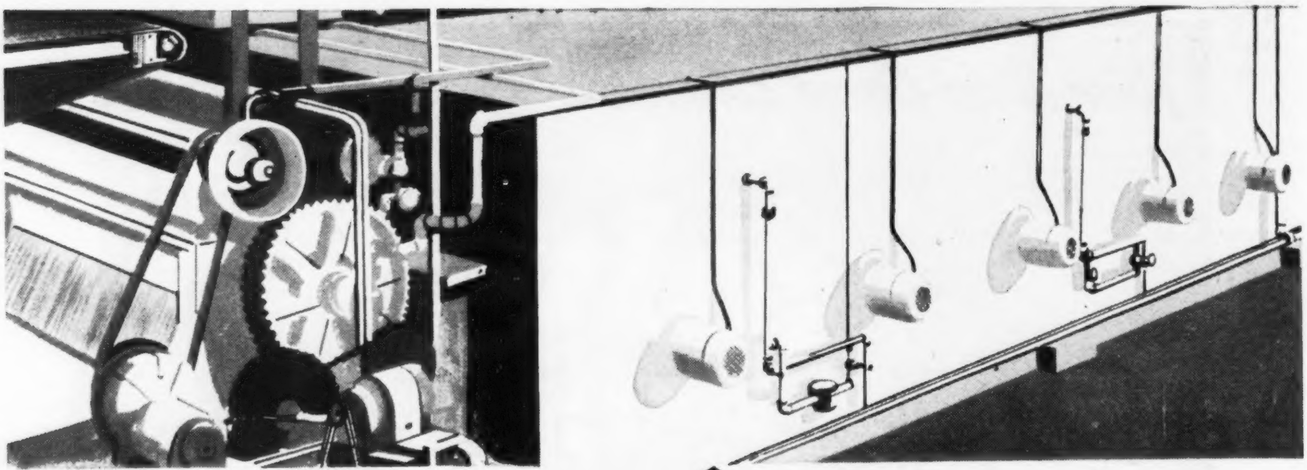
This new industry will be built on the foundation of private and governmental research and development that has anticipated this crisis in our industrial life. Which or what combination of the three processes that are offered as solutions will develop? This question will largely be answered by the considerations that have been discussed in this article.

Raw materials that can supply these plants are oil shale, natural gas, and coal. At present, there are no commercial plants of any kind in operation, and the one demonstration plant, the government's shale-oil installation at Rifle, Colorado, is not fully completed. Two commercial plants utilizing natural gas in the Fischer-Tropsch process are planned, while a government demonstration plant using coal in the same process is under construction. The government's construction work on a demonstration plant marks the high point of progress in the field of coal hydrogenation.

To a large extent, the type of product desired will determine the processing method. Oil shale is now best adapted to the production of fuel and heavy Diesel oil; the Fischer-Tropsch process yields good motor gasoline and excellent Diesel fuel; coal hydrogenation gives aviation gasoline or a range of fuel oils. However, the economical use of available resources will also determine this choice, as well as fix plant location.

Considerable variation in estimates of the costs of such a program for industry and in the price of the finished products is perhaps to be expected in view of the many technical problems yet to be solved. Capital investment costs will be high, and the first installations may operate at a loss. It is anticipated that with improvements that will develop from further research, costs of petroleum at the plant will be from 5 to 7 cents higher than the present price of petroleum.

From this survey of the status of liquid synthetic fuels today, it is obvious that the development of such an industry to supply our fuel deficiencies cannot be delayed until an emergency is upon us. Secretary of the Interior Krug's statement that production of the 2 million barrels of oil a day necessary to meet expected demand would require approximately 9 billion dollars and 16 million tons of steel indicates the size of the task. It would be 5 to 10 times the magnitude of the synthetic-rubber program during the last war.



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*Packaging

Pressure-sensitive adhesive tape. No. 2,429,223. Warner Eustis and George Robert Orrill to The Kendall Company.
Paper, cellulose bags. No. 2,429,505. Arthur Ashman to E. S. & A. Robinson, Limited.
Blank for dust-tight rectangular carton. No. 2,429,540. George M. Woodruff to The Proctor & Gamble Company.
Electrically heated rotatable liquid container. No. 2,429,662. Donald F. Ayres to The De Laval Separator Company.
Can body making machine. No. 2,429,982. Thomas Begg to American Can Company.
In container for preserving cheese and other products which develop gases, combination of can end having centrally disposed vent opening and plurality of spaced perforations surrounding opening, valve united to can end and normally overlapping vent opening on exterior of container. No. 2,429,984. Ralph M. Berglund to American Can Company.
Producing reenforced tubular sheet metal can body. No. 2,430,010. Nelson Geertsen to American Can Company.
Tear-strip type container and reclosure therefor. No. 2,430,035. Ivan D. Thornburgh to American Can Company.
Tear-strip type container and reclosure therefor. No. 2,430,036. Ivan D. Thornburgh and Frank W. Goodrich to American Can Company.
Container for packaging of coffee, formed of film of partial acetal of polyvinyl alcohol, wherein from 12% to 55% of available hydroxyl groups of polyvinyl alcohol have been reacted with aliphatic aldehyde containing from one to six carbon atoms. No. 2,430,065. Lloyd Lyn Leach to E. I. du Pont de Nemours & Company.
Machine for soldering side seams of can bodies. No. 2,430,219. William Elser to Continental Can Company, Inc.
Laminated sheet heat-sealable container. No. 2,430,459. Robert A. Farrell and Charley L. Wagner to Marathon Corporation.
Packaging freshly ground roasted coffee, comprises placing coffee in bag formed of gas impervious material, disposing within bag synthetic resin having anion-exchange properties. No. 2,430,663. Abraham Sidny Behrman.

*Paints, Pigments

Dehydrating castor oil to form light-colored drying oil. No. 2,429,380. William T. Walton, Charles A. Coffey and Oswald E. Knapp to The Sherwin-Williams Company.
Aqueous emulsion paint comprising protein selected from casein and alkali dispersible vegetable protein derived from soybeans, solvent for proteins, water, water insoluble film forming material, colored pigment, streaking and blotching inhibiting material. No. 2,430,828. Marvin T. Schmidt and John K. Wise to United States Gypsum Company.

*Paper, Pulp

Photoelectric apparatus for inspection of paper strips. No. 2,429,331. Lawrence T. Sachtleben to Radio Corporation of America.
Paper treating method. No. 2,429,539. Frederick P. Wood to Simplex Paper Corporation.
Pulp washer. No. 2,430,135. John Neumann to Alpha Cellulose Corporation.

Canadian

Bleaching groundwood, by applying a peroxygen bleaching agent at the point of grinding of wood. No. 446,037. St. Regis paper Co. (Russell Shearer).

*Petroleum

Conversion treatment of low-boiling mixture of hydrocarbons comprising isoparaffin, corresponding normal paraffin and low-boiling olefins capable of alkylating said isoparaffin in excess of amount necessary to alkylate all isoparaffin. No. 2,429,205. Frank J. Jenny, Myrle M. Perkins and Michael J. Cicalese to The M. W. Kellogg Company.
Effecting hydrocarbon conversion in presence of a hydrogen halide and fugitive metal halide catalyst. No. 2,429,218. Samuel C. Carney to Phillips Petroleum Company.
Catalytically promoted endothermic conversion of hydrocarbon reactants. No. 2,429,359. Louis S. Kassel to Universal Oil Products Company.
Separating oil-wax mixture. No. 2,429,430. August Henry Schutte.
Conversion of fluid hydrocarbons to lower boiling gaseous hydrocarbons in presence of moving particle-form solid contact material. No. 2,429,545. Eric V. Bergstrom to Socony-Vacuum Oil Company, Inc.
Cracking olefin hydrocarbons. No. 2,429,566. Francis O. Rice.
Producing saturated branched chain hydrocarbons. No. 2,429,575. Walter G. Appleby and Lawrence L. Lovell and Mark P. L. Love to Shell Development Company.
Production of hydrocarbons from subsurface formation method for determining path of both injected and produced gas in depth and areally. No. 2,429,577. Richard W. French, Jr., to Continental Oil Company.
Treating oil wells to retard corrosion and scale formation on metal equipment in bore hole. No. 2,429,593. Leslie Cline Case to Gulf Oil Corporation.
Determining small amounts of water in gas. No. 2,429,694. Gilbert W. King to Arthur D. Little, Inc.
Producing aviation gasoline blending stock. No. 2,429,718. Clarke T. Harding to Standard Oil Development Company.
Refining distillatable petroleum wax which normally has poor heat and light stability even after acid treatment, de-oiling and bauxite filtering, comprises subjecting wax combination of two operations, one comprises solvent de-oiling, other consists in distilling wax over alkali using excess of alkali removing and condensing distilled wax vapors. No. 2,429,727. Robert A. Macke and Herman J. Zoeller to Standard Oil Development Company.
Catalytic cracking of hydrocarbon oils. No. 2,429,854. John W. Teter to Sinclair Refining Company.
Simultaneous production of quality gasoline and quality Diesel fuel from hydrocarbon oils boiling above gasoline boiling range. No. 2,429,875. George M. Good, Hervey H. Voge and Bernard S. Greensfelder to Shell Development Company.
Breaking sulphuric acid-hydrocarbon emulsions formed in sulphuric acid treatment of hydrocarbons, consisting in addition and distribution in fresh concentrated sulphuric acid admitted to treating process of polymer composition recovered from concentrated sulphuric acid spent in treatment in small proportion intimately admixed with fresh acid. No. 2,429,965. Alexander Paterson Shearer, Leslie Benjamin Witten and Thomas Cubin.
Conversion of hydrocarbons with alkali metal-free catalyst comprising silica and amphoteric oxide. No. 2,429,981. John R. Bates to Houdry Process Corporation.
Breaking petroleum emulsions of water-in-oil type. No. 2,429,996. Melvin De Groote and Bernhard Keiser to Petrolite Corporation, Ltd.
Breaking petroleum emulsions. No. 2,429,997. Melvin De Groote and Bernhard Keiser to Petrolite Corporation, Ltd.
Breaking petroleum emulsions. No. 2,429,998. Melvin De Groote and Bernhard Keiser to Petrolite Corporation, Ltd.
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Breaking petroleum emulsions. No. 2,430,001. Melvin De Groote and Bernhard Keiser to Petrolite Corporation, Ltd.
Breaking petroleum emulsions. No. 2,430,002. Melvin De Groote and Bernhard Keiser to Petrolite Corporation, Ltd.
Breaking Petroleum emulsions. No. 2,430,003. Melvin De Groote and Bernhard Keiser to Petrolite Corporation, Ltd.
Production of lower boiling hydrocarbons of high aromaticity. No. 2,430,096. William Herman Barcus to Sun Oil Company.
Alkylation process comprises reacting isoparaffin with olefin in presence of liquid hydrogen fluoride catalyst having dissolved therein minor proportion of inorganic salt soluble in liquid hydrogen fluoride selected from alkali metal fluorides and sulfates. No. 2,430,181. Carl B. Linn to Universal Oil Products Company.
Alkylation of ethylene and its normally gaseous homologues in presence of catalyst consisting of mobile liquid comprising reaction product formed by contacting aluminum chloride with ethylene and low-boiling isoparaffin. No 2,430,212. Louis A. Clarke and Ernest F. Pevere to The Texas Company.
Multistage HF alkylation of isoparaffins by means of olefins. No. 2,430,228. James B. Kirkpatrick, Carleton H. Schlesman and Arlie A. O'Kelly to Socony-Vacuum Oil Company, Inc.
Catalytic alkylation of isoparaffins by reaction with olefins in presence of liquid hydrogen fluoride. No. 2,430,333. Stuart H. Hadden to Socony-Vacuum Oil Company, Inc.
Heating oil for petroleum crackers. No. 2,430,344. William Wallace Kemp to The C. M Kemp Manufacturing Company.
Resolving mixture comprising high-boiling piperylene and low-boiling piperylene. No. 2,430 395. Frederick E. Frey to Phillips Petroleum Company.
Prevention of siliceous deposits in fluorine-containing catalyst hydrocarbon conversions. No. 2,430,453. Ralph C. Cole to Phillips Petroleum Company.
Prevention of siliceous deposits in processes wherein hydrocarbons are contacted with organic fluorine-removing material containing silica. No. 2,430,460. Frederick E. Frey to Phillips Petroleum Company.
Bituminous coating composition containing bitumen and 0.1% to 1.5% by weight of oil-soluble lower amine, 0.5% to 5.0% of oil-soluble polyvalent metal soap of high molecuar weight acid. No. 2,430,546. Robert Jamieson Agnew to The Texas Company.
Alkenylation of alkenylatable aromatic compound. No. 2,430,660. William N. Axe to Phillips Petroleum Company.
Production of aliphatic derivative of aromatic compound, comprises reacting alkenylatable aromatic compound with open chain 1,3-diolefin in presence of complex catalyst consisting of one mol of boron trihalide per mol of alcohol. No. 2,430,661. William N. Axe to Phillips Petroleum Company.

** U. S. Patents from Vol. 604, Nos. 1, 2, 3, 4. Canadian from December 30–January 30.*

Akylation of hydrocarbons in presence of sulfuric acid. No. 2,430,673. James D. Gibson and Ralph C. Cole to Phillips Petroleum Company.

Conversion of hydrocarbons wherein hydrocarbon vapors are contacted with solid porous catalyst containing silica and alumina. No. 2,430,-724. Jacob R. Meadow to Socony-Vacuum Oil Company, Inc.

Conversion of hydrocarbons wherein hydrocarbon vapors are contacted with solid porous catalyst containing silica and alumina. No. 2,430,-735. Frederick E. Ray, Russell Lee and Jacob R. Meadow to Socony-Vacuum Oil Company, Inc.

Catalytically converting high-boiling hydrocarbons into low-boiling hydrocarbons distilling within gasoline boiling range. No. 2,430,784. Robert F. Ruthruff to The M. W. Kellogg Company.

*Photographic

Light sensitive layer on suitable base comprising mono diazo-N-sulfonate derivative of p-phenylene diamine, azo component, alkali metal bisulfite, member of group consisting of ketones, ketonic acids, and aromatic aldehydes which form addition products with bisulfites. No. 2,429,249. William Henry Von Glahn and Maximilian K. Reichel to General Aniline & Film Corporation.

Lithographic masking paper comprising stock sheet dyed orange to yellow color which is transparent and dye of which is insensitive to alkali, coating of mixture of clay and sizing upon sheet of stock, coating of mixture of silicate of soda and equalizer over clay coating. No. 2,429,271. Frank A. Marty.

Photogelatin printing plate process. No. 2,430,498. Victor C. Ernst.

Photographic emulsion sensitized with combination of merocyanine dye and monomethinecyanine, trimethinecyanine, dimethinehemicyanine or styryl dye. No. 2,430,558. Burt H. Carroll, Leslie G. S. Brooker and John Spence to Eastman Kodak Company.

Producing positive sound track in multi-layer photographic film. No. 2,430,565. Charles H. Guell to Eastman Kodak Company.

New article of manufacture processed motion-picture film comprising base carrying gelatin layer, surface of which layer is comprised of reaction product of gelatin and high molecular weight fatty acid chloride. No. 2,430,585. John Russell and Robert C. Houck to Eastman Kodak Company.

Canadian

Colour developer comprising arylsulphonhydrazide. No. 445,873. General Aniline & Film Corp. (Willy A. Schmidt and Joseph A. Sprung).

*Polymers

Thermosetting plastic from red wood pulp and furfuryl alcohol-formaldehyde resin. No. 2,429,329. Edward Reineck and Isaac R. Dunlap to The Institute of Paper Chemistry.

Halogenated cross linked aromatic amine polymer. No. 2,429,554. Samuel S. Kistler to Norton Company.

Producing polymers comprising heating dimethylsulfolene in presence of member of group consisting of molecular oxygen and peroxides at between 80°C. and 200°C. No. 2,429,582. Rupert C. Morris and John L. Van Winkle to Shell Development Company.

Improving processing characteristics of butadiene-styrene interpolymers containing 5% to 60% of styrene. No. 2,429,858. John R. Vincent and Gastao Etzel to E. I. du Pont de Nemours & Company.

Producing pliable resin having rubber-like resiliency. No. 2,429,859. Joseph Frederic Walker to E. I. du Pont de Nemours & Company.

Liquid solution of polyethylene suitable for hot-dip coating of objects. No. 2,429,861. Richard G. Woodbridge, III, to E. I. du Pont de Nemours & Company.

Composition of matter consisting of 15 parts by weight of polyvinyl butyral containing 41.5% combined butyraldehyde, 10 parts resorcinol, 30 parts 37% aqueous solution of formaldehyde, 3 parts 10% aqueous solution of sodium hydroxide, 185 parts ethyl alcohol denatured with methyl alcohol. No. 2,430,053. Albert Hershberger to E. I. du Pont de Nemours & Company.

Drying alcohol-wet polyvinyl alcohol comprises subjecting polyvinyl alcohol to atmosphere of moist air at 90°C-115°C. No. 2,430,372. Gelu S. Stamatoff to E. I. du Pont de Nemours & Company.

Polymerizing butadiene-1,3 hydrocarbon in aqueous emulsion in presence of water-soluble xanthate and oxygen supplying per-salt. No. 2,430,562. Charles F. Fryling to The B. F. Goodrich Company.

Colorless, transparent, hard, rubbery plastic and elastic resinous material consisting of copolymerization product of 1 part of dialkyl ester of maleic acid, containing 5 to 10 carbon atoms in alkyl radical, with 2 to 7 parts by weight of vinyl acetate. No. 2,430,564. Philip L. Gordon to American Waterproofing Corporation.

Polymerization of conjugated dienes in presence of biological oxidation catalysts. No. 2,430,590. William D. Stewart to The B. F. Goodrich Company.

Ureides of glyoxylic and glycollic acids as catalysts for polymerization of butadiene-1,3 hydrocarbons. No. 2,430,591. William D. Stewart to The B. F. Goodrich Company.

All-climate plastic shortening. No. 2,430,596. Norbert W. Ziels and Werner H. Schmidt to Lever Brothers Company.

Canadian

Process of making a tough, elastic and insoluble polyvinyl resin. No. 446,175. Shawinigan Chemicals, Ltd. (Albert Harold Heatly and Henry Michael Collins).

*Processes and Methods

Recovering catalyst used in catalytic conversion processes. No. 2,429,-247. Edward M. Van Dornick to Foster Wheeler Corporation.

Producing wood tar and charcoal in kilns. No. 2,429,272. Michael Melamid.

In catalytic reaction process wherein granular catalyst is continuously passed in succession through reaction zone, reactivation zone to reaction zone, method of protecting catalyst from breakage and attrition in passage. No. 2,429,402. Hyman R. Davis to The Lummus Company.

Method of gas analysis including steps of separating gases from related materials, collecting gases, separately releasing respective constituents of collected gases, passing each constituent separately through thermal tranfer zone, determining quantity of each constituent as it passes through zone. No. 2,429,555. Cecil T. Langford, David H. McKellar and Herbert T. Davidson.

Contacting solid particles with gaseous fluid. No. 2,429,721. Charles E. Jahnig to Standard Oil Development Company.

System for directionally throwing slurry in which solid particles are homogeneously suspended in carrying liquid, blasting wheel for directionally projecting slurry. No. 2,429,742. Kenneth H. Barnes to American Wheelabrator & Equipment Corporation.

Treating materials and promoting chemical reactions in closed reaction chamber by contacting reactant fluid with loosely packed, confined mass of small-size solids. No. 2,429,980. John J. Allinson to Lion Oil Company.

In application of finely divided adsorptive solid catalyst which declines in activity and adsorptive ability in use, method of maintaining high activity in continuous operation. No. 2,430,015. John A. Hatton and Donald L. Cleveland and Norman E. Peery to Shell Development Company.

Improved method of hot molding polyvinyl plastics. No. 2,430,033. Thomas F. Stacy and Max D. Farmer to The French Oil Mill Machinery Company.

Preparing coal for use in colloidal fuels. No. 2,430,085. Kenneth A. Spencer and Donald W. Machin to The Pittsburg and Midway Coal Mining Company.

Electroforming of metals. No. 2,430,092. Axel Westin one-third to Sven Westin one-third to Axel Westin and one-third to Charles Greenblatt.

Solid heat convertible, soluble, fusible polymerization product of mixture comprising divinyl benzene and diethyl fumarate. No. 2,430,109. Gaetano F. D'Alelio to Pro-phy-lac-tic Brush Company.

Artificial magnetite in heavy-media separation. No. 2,430,186. Victor Rakowsky to Minerals Beneficiation, Inc.

Continuous catalytic operation. No. 2,430,245. John W. Payne to Socony-Vacuum Oil Company, Inc.

Production of copolymer of maleic anhydride and polymerizagle monoethylenic hydrocarbon. No. 2,430,313. Charles A. Vana to E. I. du Pont de Nemours & Company.

Bonding of laminates by means of isocyanates. No. 2,430,479. Burt Carlton Pratt and Henry Shirley Rothrock to E. I. du Pont de Nemours & Company.

*Rubber

Making composite product by incorporating rayon cords in vulcanizable rubber material. No. 2,429,397. Jack Compton and Matthew W. Wilson to The B. F. Goodrich Company.

Producing butadiene-1,3 styrene copolymer synthetic rubber reinforced with calcium silicate. No. 2,429,439. Jerome C. Westfahl, Daniel S. Sears and John W. Martindale to The B. F. Goodrich Company.

Reaction products of hexamethylenetetramine and petroleum wax substituted oxyaromatic compounds having rubberlike properties, method of preparing. No. 2,429,565. Orland M. Reiff to Socony-Vacuum Oil Company, Inc.

Rubbery, extensible vulcanization product of mixture comprising rubbery extensible vinyl alkyl ether polymer, sulfur, and diacyl peroxide. No. 2,429,587. Calvin E. Schildknecht to General Aniline & Film Corporation.

Synthetic rubber-like material having high oil and freeze resistance being copolymer of 2-fluoro-1,3-butadiene and acrylonitrile containing 80% to 97% of 2-fluoro-1,3-butadiene and 20% to 30% of acrylonitrile. No. 2,429,838. Walter E. Mochel to E. I. du Pont de Nemours & Company.

Processing soluble dimethyl silicone elastic products prepared by use of ferric chloride. No. 2,430,032. Donald W. Scott to General Electric Company.

Vulcanization of butadiene-styrene copolymer having dispersed therein paracoumarone resin and filler. No. 2,430,385. Theodore A. Bulifant to Allied Chemical & Dye Corporation.

Preparing rubber products from unpeptized rubber latex. No. 2,430,481. Charles Saint-Mleux to Societe Meridionale du Caoutchouc Someca, Societe a Responsabilite Limitee.

Natural or synthetic rubber stabilized by antioxidant extracted from fatty oils. No. 2,430,556. Loran O. Buxton to Nopco Chemical Company.

Canadian

Polymerized chloroprene synthetic rubber having dispersed therein a magnesia and carbon containing product obtained by reacting magnesium and an oxide of carbon in the vapour phase. No. 445,768. The Permanente Metals Corp. (Gerald von Stroh).

Pitch base rubber compounding material dispersible in rubber at temperatures below about 150°F. No. 445,840. Allied Chemical & Dye Corp. (Arthur B. Cowdery.

*Specialties

Lubricating oil composition comprising wax-containing mineral oil and amount sufficient to reduce pour point not in excess of 5% of product obtained by reacting aromatic hydrocarbons with material of group consisting of formaldehyde and polymers thereof in presence of sulfuric acid as catalyst to produce formaldehyde-cyclic resinous product, acylating resultant product in presence of Friedel-Crafts catalyst with acylating agent whose acyl groups contain at least 6 carbon atoms per molecule. No. 2,429,479. Louis A. Mikeska to Standard Oil Development Company.

Preparing smoking tobacco comprises treating tobacco with picric acid to form with nicotine in tobacco addition product less volatile than nicotine to be oxidized during smoking. No. 2,429,567. Frank J. Sowa to American Machine & Foundry Company.

Improved chewing gum comprising chewing gum base, amide of fatty acid having at least 8 carbon atoms. No. 2,429,664. Harry Bennett.

Penetrating liquid for releasing "frozen" ferrous metallics screw-threaded joints consisting of intimate admixture of carbon tetrachloride, acetic acid, gas-oil and lubricating oil, in proportion by volume of 3:1:2:4. No. 2,429,735. Henri Joan Vuyk.

Lubricant composition for use under service conditions in presence of water to prevent rusting due to contact between metal and water consists of lubricating oil and 0.1%-2.0% of oil soluble water-insoluble 1,2-dihydroxybenzene. No. 2,429,905. Wortley Andrew Wright to Sun Oil Company.

Extracting hard wax directly from sugar cane mud. No. 2,430,012. Werner F. Goepfert to Interchemical Corporation.

Preventing odor fading due to oxidation of mercaptan bearing odorant in combustible gas free from gum forming constituents. No. 2,430,050. Charles E. Gill.

Mineral oil rustproofing composition comprising petroleum hydrocarbon vehicle containing corrosion inhibiting amount of mixture of monoketone having long alkyl chain and octyl alcohol. No. 2,430,058. Joseph H. Klaber to Quaker Chemical Products Corp.

Deflagrating composition comprising oxidizing ingredient, fuel ingredient, and tricalcium phosphate. No. 2,430,068. Matthew W. Maughan to Remington Arms Company, Inc.
Impregnating wood members according to open tank method. No 2,430,641. Neal T. MacKenzie and Harry E. Hall to General Timber Service, Inc.
Thermo-setting dry powdered adhesive base, comprising: as resin base alkali-catalyzed heat condensation compound of cresylic acid, furfural and alkali-dispersible protein modifier; and in admixture with base alkali-dispersible protein extender. No. 2,430,736. Donald V. Redfern to Adhesive Products Company.
Composition consisting of bitumen and from 0.1% to 10% of compound from the class consisting of oil-soluble dihydroxy aluminum petroleum sulfonates and mixtures of oil-solube mono- and dihydroxy aluminum petroleum sulfonates. No. 2,430,815. Arthur B. Hershberger and Felix C. Gzemski to The Atlantic Refining Company.
Lubricant produced by heating mixture of 1 mole of aliphatic hydroxy polycarboxylic acid of not more than 6 carbon atoms with 1 to 2 moles of glycol at 150°C to 200°C, etc. No. 2,430,842. William S. Young to The Atlantic Refining Company.

*Textiles

Obtaining prolamine synthetic fibers, steps of extruding aqueous alkaline solution of prolamine into aqueous coagulating bath containing formaldehyde, acid selected from strong mineral acids and admixtures of said acids, salt material selected from water-soluble inorganic salts and admixtures of said salts, etc. No. 2,429,214. Gordon F. Biehn and Edward T. Cline to E. I. du Pont de Nemours & Company.
Forming linear superpolyester containing non-benzenoid unsaturation. No. 2,429,219. John C. Cowan and Donald H. Wheeler.
Apparatus for saturating bibulous fibrous web with saturant in liquid form. No. 2,429,314. Joshua H. Goldman to Fibre Products Laboratories, Inc.
Heat-reactive adhesive bonding medium for hot pressing work. No. 2,429,369. Philip Hamilton Rhodes to Koppers Company, Inc.
Stencil film for hand-cutting stencil designs for use in forming silk screen stencils, comprising paper backing sheet, water soluble adhesive coating thereupon, film removably supported by water soluble adhesive coating, film comprising impervious coating including film forming material selected from cellulose nitrate lacquer and cellulose acetate lacquer, and roughening agent selected from whiting, pumice powder and magnesium powder. No. 2,429,986. Ernest Clair Bowers to Minnesota Mining & Manufacturing Company.
Nitrogeneous textile fibers dyed with sulfonated aminophthalalkylolimide. No. 2,430,231. Harold T. Lacey and Robert E. Brouillard to American Cyanamid Company.
Filament forming solution comprising aqueous solution of polyvinyl alcohol and small quantity of lauryl pyridinium chloride. No. 2,430,499. Gustavus J. Esselen and Martin H. Gurley, Jr. to Pro-phy-lac-tic Brush Company.

*Water, Sewage and Sanitation

Automatic self-cleaning water strainer. No. 2,429,417. Franklin R. Magill.
Passing liquid downward through first and second beds of zeolite and thereafter passing liquid downward through said second and first beds of zeolite. No. 2,429,943. Frank D. Prager to Graver Tank & Mfg. Co., Inc.
Treating oil refinery pond slurry. No. 2,430,182. Philip J. McGuire, Frank W. Brittain and Elizabeth D. Rollins to Oliver United Filters, Inc.

Agricultural

Uniformly mixing finely divided tobacco material with nicotine sulfate as insecticide. No. 2,431,672 Robert B. Arnold to Tobacco By-Products and Chemical Corporation.
Insecticidal composition comprising pyrethrin and compound represented by formulae described in patent. No. 2,431,844. Martin E. Synerholm to Boyce Thompson Institute for Plant Research, Inc.
Insecticidal composition comprising pyrethrin and compound represented by formulae described in patent. No. 2,431,845. Martin E. Synerholm to Boyce Thompson Institute for Plant Research, Inc.
Insecticidal composition of matter comprising as active ingredient beta-(p-chlorophenyl)-glycidic acid butyl ester of formula described in patent. No. 2,432,118. Paul Muller and Walter Schindler to J. R. Geigy A. G.
Fungicidal composition comprising thiocarbamosulfenamide. No. 2,432,-255. Joseph B. Skaptason to United States Rubber Company.
Immunizing seed comprises treating seed with N, N-dimethyl N'-acetyl thiocarbamosulfenamide. No. 2,432,256. Joseph B. Skaptason to United States Rubber Company.
Insect powder sprayer. No. 2,432,288. Abraham Danziger.

Biochemical

Producing ethyl alcohol by fermentation comprising cultivating yeasts of species Endomycopsis fibuliger in symbiosis together with yeasts of genus Saccharomyces in contact with starch-containing substrate. No. 2,431,004. Lynferd J. Wickerham.
Production of glycerol by fermentation. No. 2,432,032. Arthur Charles Neish, George Aleck Ledingham and Allister Clark Blackwood to Honorary Advisory Council for Scientific and Industrial Research.

Cellulose

Plastic composition comprising cellulose ester of saturated straight-chain fatty acid with from 2 to 4 carbon atoms and as plasticizer hexitol ketal of chloroacetone with not more than 2 free hydroxyl groups. No. 2,430,926. Rudolph Max Goepp, Jr. to Atlas Powder Company.
Reacting organic solvent-soluble organic derivative of cellulose having at least one free hydroxyl group in molecule dissolved in inert organic solvent with paraformaldehyde and methanol in presence of from 40% solution in methanol of paratoluene sulfonic acid, to form organic solvent-soluble organic derivative of cellulose containing group—O—CH_2—O—CH_3. No. 2,430,911. William Hale Charch and Francis B. Cramer to E. I du Pont de Nemours & Company.
Producing dense pressed lignocellulosic product having decorative surface. No. 2,431,720. Grant S. Willey to United States Gypsum Company.

Production of organic acid esters of cellulose. No. 2,432,153. Clifford I. Haney and Mervin E. Martin to Celanese Corporation of America.
Reacting carbohydrate in anhydrous reaction in which hydrogen atom of hydroxyl group is substituted, and there is liberated strong inorganic acid selected from hydrochloric acid and nitric acid, carrying out reaction in presence of fluoride salt. No. 2,432,280. George V. Caesar to Stein, Hall & Company, Inc.
Production of organic acid esters of cellulose of improved characteristics wherein cellulose is esterified with aliphatic solvent and inorganic acid catalyst. No. 2,432,341. George W. Seymour and Mervin E. Martin to Celanese Corporation of America.

Canadian

Process for treating cellulose fibres, impregnating the fibres with a formaldehyde solution in the presence of an acid catalyst and in the presence of an anti-abrasion agent. No. 446,405 Heberlein Patent Corp. (Ernst Weiss).
Production of a dyed twisted cellulose yarn the combination with the steps of drying, twisting, setting the twist, of a treatment in water under pressure above 100° centigrade to stabilize the dyeing affinity of the yarn. No. 446,681 (Horace James Hegan and Edwin Holroyd Sharples).

Ceramics

New article comprising crystalline silicon carbide. No. 2,431,326. Albert H. Heyroth to The Carborundum Company.
Refractory articles comprising silicon carbide grain of hexagonal crystal habit powdered silicon and carbon. No. 2,431,327. Charles F. Geiger to The Carborundum Company.
Forming ceramic objects by disseminating raw, moisture-containing ceramic composition to form mist, depositing particles of disseminated composition upon porous matrix having surface corresponding to contours of object to be formed, etc. No. 2,431,629. Fred V. Wind and Matthew J. Raimondo to Pacific Clay Products.
Glass having power factor less than .06%, dielectric constant of at least 7 and softening temperature less than 600°C. No. 2,431,980. William H. Armstead, Jr., to Corning Glass Works.
Optical glass having following constituents: silicon dioxide 10%-25%, barium oxide 10%-35%, lead monoxide 10%-20%, and boron trioxide 10%-25%. No. 2,431,983. Raymond Edward Bastick and Wilfred Marsh Hampton to Chance Brothers Limited.

Canadian

A refractory comprising chrome ore, magnesium oxide and iron oxide. No. 446,474. E. J. Lavino & Co. (Raymond E. Griffith).
Treating glass surfaces by an atmosphere of hydrogen fluoride. No. 446,761. Lanic, Inc. (Victor Walker).
Preparing vitreous enamel coated articles by electro-depositing on an electrically conducting ferrous metal article to be enamelled a thin plate of a metal compatible with a vitreous enamel and capable of bonding a vitreous enamel to the surface. No. 446,546. Poor & Co. (Allan E. Chester).

Coatings

Producing floor coverings which comprises steps of applying oleoresinous decorative material to surface of backing, applying to decorated surface layer of adhesive containing material selected from ester gum, hydrogenated rosin and coumarone resin sheeting polyvinyl chloride, applying adhesive containing methacrylate resin to sheeted polyvinyl chloride, placing sheet on backing with adhesives in contact, subjecting product to heat and pressure. No 2,430,934. James W. Kemmler and Edward R. Erb, Jr. to Sloane-Blabon.
Providing surface with tough resinous coating comprising, atomizing hydrocarbon material, atomizing cesium, depositing mixed spray on article. No. 2,431,315. Folsom E. Drummond to Chemical Developments Corporation.
Making wrinkling oil from untreated non-wrinkling oil, consists in heating in inert ambient atmosphere with ethyl cesium. No. 2,431,357. Gordon M. Williams to New Wrinkle, Inc.
Coating apparatus. No. 2,432,081. Robert L. Bartholomew to Raytheon Manufacturing Company.
Solution for applying protective material to fresh fruit comprises coumarone-indene resin dissolved in highly volatile petroleum distillate solvent and ester of sodium sulfosuccinic acid with hydrocarbon group having at least six carbon atoms. No. 2,432,406. Ray D. Gerwe and Martin A. Slade, Jr. to Food Machinery Corporation.

Canadian

Spray coating the surface of an article in an electrostatic field. No. 446,480. Harper J. Ransburg Co. (Harold P. Ransburg and Norman Curtis).
Production of adherent coatings by melting a polythene composition and projecting the liquid so produced into the surface. No. 446,624. Canadian Industries, Ltd. (James Harold Williams).

Dyes, Pigments

Device for developing diazo type printing material. No. 2,431,041. Gerald L. Hassler to General Aniline & Film Corporation.
Hollow wound package holder for dyeing apparatus. No. 2,431,280. Michael W. Reno and James E. Dougherty.
Improving fastness of dyed textile material by application thereto of aminotriazinealdehyde resin. No. 2,431,562. Raymond W. Jacoby to Ciba Products Corporation.
Producing aluminum particles such as powders or pastes suitable for paints or pigments. No. 2,431,565. Peter I. Klock to Aluminum Company of America.
Dyestuff composition for printing textile fibers comprising ester salt of leuco vat dyestuff and water-soluble, stable internal salt of tertiary to quaternary amino acid selected from betaines which contain aralkyl radical and sulfobetaines which contain aralkyl radical. No. 2,431,708. Roger Ratti and Philipp Brandt to Durand & Huguenin S. A.
Dyestuff or pigment characterized by good tinctorial value and comprising co-reacted mixture of disazo compounds. No. 2,431,889. Alexander H. Popkin to Sun Chemical Corporation.
Dyeing article composed of acrylonitrile polymer comprises treating article with naphthol first component subjecting treated article to aqueous acid solution, applying to article diazotized naphthol base

coupling component for first component. No. 2,431,956. Frank Baldwin Moody to E. I. du Pont de Nemours & Company.
Dyestuff preparations containing ester salt of leuco vat dyestuff, salt of quaternary ammonium compound, and acid amine. No. 2,432,041. Roger Ratti and Philipp Brandt to Durand & Huguenin.
Trinuclear cyanine dyes. No. 2,432,060. Alfred W. Anish to General Aniline & Film Corporation.
Azo compound having formula described in patent. No. 2,432,393. Joseph B. Dickey and James G. McNally to Eastman Kodak Company.
Azo-dyestuff of formula described in patent. No. 2,432,403. Friedrich Felix and Henri Riat to Society of Chemical Industry in Basle.
Dyeing textile filaments, yarns and threads characterized by being wrinkled with longitudinal irregularities. No. 2,432,404. Luigi C. Galatioto to Textron Inc.
Azo hydroxy aza indolizines. No. 2,432,419. Newton Heimbach to General Aniline & Film Corporation.
Making metallic pigment. No. 2,432,465. Gordon M. Babcock to Reynolds Metals Company.

Canadian

Production of colours for camouflage of military equipment, comprising blending a combination of pigments to produce a natural foliage tint. No. 446,381. Arco Co. (Paul L. Hexter and Russell Shepheard).
Improvement in the process of dyeing by subjecting wetted material between iron positive and nickel negative electrodes to the action of a direct electric current. No. 446,785 Standard Bleachery and Printing Co. (Carl H. Brubaker).

Equipment

Controlling continuous charging of accumulator battery from A.C. supply over rectifier. No. 2,431,311. Lars Per Cronvall to International Standard Electric Corporation.
Battery charging control system. No. 2,431,312. Lars Per Cronvall to International Standard Electric Corporation.
Viscosimeter comprising cylindrical tube to be vertically disposed, to contain liquid to be tested; body in tube free to move length thereof impeded only by contents therein, said body comprising hollow cylindrical cup open at upper end provided with bottom having orifice therein. No. 2,431,378. Louis C. Eitzen and William C. Schwaderer.
Apparatus for humidifying and cleaning gaseous fluids. No. 2,431,389. Walter L. Fleisher.
Deep well pump. No. 2,431,492. Truman G. Lewis to William G. Klein.
Helical chute concentrator and method of concentration. No. 2,431,559. Ira B. Humphreys to The Humphreys Investment Company.
Apparatus for concentrating and separately collecting from comminuted mass composed of particles having different specific gravities those particles having like specific gravities. No. 2,431,560. Ira B. Humphreys to The Humphreys Investment Company.
Partially drying in spray-drier liquid containing less than 25% thickening solids. No. 2,431,623. Arthur E. Siehrs to Krim-Ko Corporation.
Heating apparatus for high temperature reactions and conversions including outer metal shell, annular lining for protecting shell from destructive effects of high temperatures and porous tube mounted in shell and spaced from lining within which high temperature reaction or conversion may be carried out. No. 2,431,632. David G. Brandt to Cities Service Oil Company.
Testing hardness of material comprising causing coated indenter to penetrate material, measuring distance coating is wiped back to ascertain volume of indentation as index of hardness. No. 2,430,876. Arthur J. Hodges.
Photometric apparatus for continuous determination of dissolved oxygen in water and for calibrating its indications. No. 2,430,895. Richard L. Tuve and Joseph C. White and Elmer L. Luke.
Device for analyses of multicomponent gases. No. 2,431,019. Robert Bowling Barnes to American Cyanamid Company.
Powder spray dispenser. No. 2,431,081. Walter L. Rutkowski to R. C. Can Company.
Centrifugal separator with means for controlling discharge therefrom. No. 2,431,142. August Henry Schutte.
Mercury vapor tube having envelope on wall whereof mercury is condensed in use, etc. No. 2,431,152. John E. White to Westinghouse Electric Corporation.
Liquid filter valve structure. No. 2,431,782. George M. Walton and Henry W. Matlock to Air-Maze Corporation.
Gravity conveying chute and controlling mechanism. No. 2,431,791. Anthony De Palma and Peter Syracusa.
Apparatus for rapid cooling of heated material. No. 2,431,799. Joseph B. Gaffney to Fuller Company.
Catalyst chamber having plurality of catalyst bodies therein. No. 2,431,803. Jesse A. Guyer and Lawrence G. Molique to Phillips Petroleum Company.
Still with vertically movable heater. No. 2,431,820. William T. S. Montgomery.
Apparatus for measuring relative displacement on thicknesses of materials. No. 2,431,841. Andre Willem Storm to Hartford National Bank & Trust Company.
Apparatus for measuring specific gravity of fluid filling pipe line system. No. 2,432,039. Norris Plank to Shell Development Company.
Fire detector of thermocouple type. No. 2,432,145. Francis C. Evans to American District Telegraph Company.
Mixing device for liquids. No. 2,432,175. George G. Schmidt.
Power sprayer. No. 2,432,309. Henry W. Gore.
Pellet mill. No. 2,432,326. Edgar N. Meakin.
Device for detecting leakage of inflammable or explosive fluids comprising switch embodying pair of spaced contacts; flexible means impervious to fluid for shielding switch; means swellable upon absorption of fluid for exerting force against shielding means to bring contacts of switch together. No. 2,432,367. Gilbert J. C. Andresen to Wingfoot Corporation.
Device for producing and dispensing dense and persistent fog. No. 2,432,372. William J. Besler.

Canadian

Apparatus for lining the bore of a pipe by electrolytic deposition. No. 446,347. (Siegfried G. Bart).
Device for smoke eradication comprising a draft-pipe, in combination with a blower. No. 446,348. (John Charles Beattie).
Operation of a plurality of electrolytic cells in a series electric circuit in the electrolysis of fused salt baths in which each cell has an anode with a portion of the surface near the bottom and heat conducting means extending to the outside. No. 446,363. (Robert J. McNitt).
Pulverizer with a casing having an outlet for material-laden air at its upper end enclosing a horizontally rotary grinding ring, rolling grinding elements on grinding ring, means for effecting movement

of grinding elements and ring, means for delivering material to be pulverized to the inner side of grinding elements, means for directing a stream of air up past the outer side of grinding ring to sweep up pulverized material discharging therefrom. No. 446,382. Babcock & Wilcox Co. (George B. Ebersole).

Material classifier comprising a pair of vertically inner and outer upright frusto-conical casing members arranged to form an annular space and inlet and outlet openings for air-borne material at the lower and upper ends. No. 446,383. Babcock & Wilcox Co. (George B. Ebersole).

Centrifugal fluid impeller comprising integral boss disc and vanes. No. 446,422. Power Jets (Research and Development) Ltd. (Reuel Duncan van Millingen and Geoffrey Raignallt White).

Motor-driven centrifugal pump including a pump casing comprising a lower element adapted to be secured to the lower wall of a tank in a non-detachable manner to project through the base of the tank. No. 446,424. Pulsometer Engineering Co., Ltd. (Lionel George Pilkington).

Heat interchange apparatus comprising the combination of a hollow body liquid inlet at one end, a liquid outlet at the opposite end, transverse partitions arranged in the body part to cause a zig-zag flow of the liquid, a system of air (or other gas) tubes mounted within the body part, a by-pass tube arranged longitudinally within the body part, one end of the said tube being situated at the inlet end of the body part, the other end being adapted to discharge into the interior of the body part in the region of the outlet and a valve for controlling the latter end of the by-pass tube. No. 446,428. Serck Radiators Ltd. (Alfred Matthew Martin).

A pipe encircled by flange in open communication with fluid conducting conduit. No. 446,521. Canadian Westinghouse Co., Ltd. (Carlton D. Stewart).

In the operation of a rotary wax filter, the method which comprises at spaced intervals of equalizing pressure across the filter surface, in lower filtration zone, maintaining a differential pressure across filter surface in upper filtering zone, directing a controlled stream of solvent liquid for wax against the filter surface, rotating to bring successive areas into contact with the solvent and continuously withdrawing said solvent liquid through the filter surface. No. 446,552 Standard Oil Development Co. (John A. Selensky).

Centrifuging apparatus. No. 446,554. Tecalemit, Ltd. (Camille Clare Sprankling Le Clair).

Pump or motor unit, a rotor comprising radial cylinders mounted for rotation about a fixed axis, pistons, a ring with axis eccentric to the axis of rotation. No. 446,614. Standard Machinery Co. (Christian E. Grosser).

A gyratory crusher adapted to provide a rocking, shifting contact on one side when the opposite side of the bowl is tilted by uncrushable material. No. 446,649. Nordberg Mfg. Co. (Edgar Buck Symons and Ewald Werner).

Explosives

Device for testing detonator. No. 2,431,683. Allan M. Biggar.

Food

Recovering dextrin from stillage syrup comprising, adjusting pH of syrup, separating precipitate, etc. No. 2,431,309. Harold W. Coles to Joseph E. Seagram & Sons, Inc.

Stabilizing cottonseed oil against oxidation comprises heating to 400°F., adding phosphatide. No. 2,431,347. Albert Scharf to American Lecithin Company.

Separating gluten from starch carrying it. No. 2,431,417. James H. Obey.

Recovering juices from sugar muds, wherein sugar cane is passed through series of cane grinding mills in form of bagasse blanket. No. 2,431,634. Jeronimo Diaz-Compain.

Obtaining protein from vegetable protein-containing material by extracting material with aqueous alkali liquid to dissolve out protein. No. 2,431,993. Glenn Davidson.

Concentrating vitamin A carotenoid content of fatty oil. No. 2,432,021. Herbert B. Larner to The M. W. Kellogg Company.

Cholinelike compounds. No. 2,432,049. Kenneth C. Swan and Norman G. White.

Manufacture of thin boiling starches. No. 2,432,195. Donald W. Hansen to A. E. Staley Manufacturing Company.

Dehydrated food containing from 5% to 25% of moisture and having liquid phase containing added sorbitol. No. 2,432,222. Alexander M. Zenzes and William Schloessinger.

Purifying impure methionine obtained by acid hydrolysis of methionine nitrile. No. 2,432,429. Herbert S. Lecky to E. I. du Pont de Nemours & Company.

Synthesis of methionine. No. 2,432,478. Herbert S. Lecky to E. I. du Pont de Nemours & Company.

Inorganic

Obtaining potassium sulphate as water soluble metathetical compound of potassium component of feldspar, and sulphur component of gypsum. No. 2,430,863. Henry Seymour Colton and Robert W. Frischmuth and Raymond L. Knowles.

Producing lead chromate from chromic acid and lead oxide. No. 2,430,-939. Reuben W. Leisy to The New Jersey Zinc Company.

Making fluosulfonic acid. No. 2,430,963. Richard Stephenson and William E. Watson to General Chemical Company.

Making tin hydrocarbon compounds comprises reacting together monohalogenated hydrocarbon, tin halide, and metallic sodium in presence of inert organic solvent. No. 2,431,038. James O. Harris to Monsanto Chemical Company.

Producing sodium chromate comprising roasting chrome ore with sodium carbonate to form sodium chromate, forming aqueous solution of sodium chromate, adding sodium sulphide to precipitate chromium hydroxide. No. 2,431,075. Thomas Parons to Pacific Bridge Company.

Fibrous catalyst system. No. 2,431,143. August Henry Schutte to The Lummus Company.

Recovery of sulphur from gaseous mixtures containing sulphur dioxide. No. 2,431,236. Edward P. Fleming and T. Cleon Fitt to American Smelting and Refining Company.

Manufacturing hygroscopic gamma alumina comprises heating hydrated sulphate of aluminum then tumbling the product. No. 2,431,370. Ralph Clark Chirnside and Leonard Arthur Dauncey to The General Electric Company Limited.

Multi-component catalyst composition consisting alumina formed by dehydration of hydrated alumina together with from 2 to 4% by weight of magnesia, 4 to 6% barium oxides calculated as barium hydroxide, 4 to 6% of potassium oxide calculated as potassium hydroxide. No. 2,431,427. Walter A. Schulze and John C. Hillye to Phillips Petroleum Company.

Compacted block of ammonia evolving material composed of intimately intermingled particles of neutral ammonium carbonate, ammonium carbamate and crystalline sodium carbonate. No. 2,431,470. Walter Hugh Fawkes.

Preparing acidic complex hydrous silicates capable of forming gels and films. No. 2,431,481. Loren C. Hurd and William L. Van Horne to Rohm & Haas

Production of sodium ferrocyanide comprises reacting 20% to 50% aqueous solution of sodium cyanide and finely divided iron removing iron particles from liquid products of reaction, evaporating until precipitation of any iron oxide takes place, removing iron oxide, continuing evaporation until solution, after cooling contains between 1% and 10% of sodium ferrocyanide. No. 2,431,601. James H. Young to E. I. du Pont de Nemours & Company.

Subjecting to electrolysis fused mixture of magnesium oxide, magnesium chloride and from 0.1 to 5.0% calculated as B_2O_3 of at least one boron compound. No. 2,431,723. Leland A. Yerkes.

Recovering aluminum halide of middle halogen from aluminum halide sludge. No. 2,431,768. Maurice J. Murray to Universal Oil Products Company.

Manufacturing thionyl chloride. No. 2,431,823. Alphonse Pechukas to Pittsburgh Plate Glass Company.

Preparing sulfuryl chloride comprises heating chlorosulfonate included in group consisting of alkali metal and alkaline-earth metal and magnesium chlorosulfonate, bringing sulfur dioxide and chlorine gases evolved from heating into contact with catalyst, condensing sulfuryl chloride. No. 2,431,880. August Merz to American Cyanamid Company.

Producing material containing compounds of alkali metal, phosphorus and aluminum. No. 2,431,946. David Lurie to American Cyanamid Company.

Manufacture of compounds of nickel and cobalt. No. 2,431,997. Arthur H. Du Rose to The Harshaw Chemical Company.

Activating red mud formed in Bayer alumina-producing process for allowing its use as gas-desulphurizing substance. No. 2,432,071. Honore Jean Thibon to Compagnie de Produits Chimiques et Electrometallurgiques Alais.

Separating magnesium from crystalline, magnesium-containing, calcium aconitate. No. 2,432,223. Joseph A. Ambler and Earl J. Roberts.

Producing coprecipitated catalyst material from aluminum chloride, ammonium molybdate and ammonia. No. 2,432,286. William H. Claussen and Homer B. Wellman to California Research Corporation.

Regenerating spent aqueous alkaline solution containing hydrosulfides extracted from sour hydrocarbons. No. 2,432,301. Lloyd C. Fetterly to Shell Development Company.

Cell for electrolysis of magnesium chloride fusions. No. 2,432,431. Robert B. MacMullin to The Mathieson Alkali Works, Inc.

Separating and recovering nickel sulfide and copper sulfide as concentrates from smelted mass free from iron and containing mechanically joined crystals of nickel sulfide and copper sulfide. No. 2,432,456. William Kelvin Sproule, George Alan Harcourt and Ernest Herbert Rose to The International Nickel Company, Inc.

Canadian

Producing HCN from calcium cyanide. No. 446,377. American Cyanamid Co. (Hal P. Eastman).

Preparing guanamines by heating an acyl dicyandiamide with cyanamide in the presence of water. No. 446,378. American Cyanamid Co. (Pierrepont Adams).

Reconditioning a contaminated aqueous alkali metal hydroxide solution containing a solutizer by steam stripping. No. 446,434 Shell Development Co. (Alan C. Nixon and Orris L. Davis).

Method of making fused magnesium orthosilicate. No. 446,491. (Victor Moritz Goldschmidt).

Preparing alumina by precipitating hydrous alumina from a solution, subjecting the precipitate to "hot aging", washing free of soluble salts, grinding, and heat treating at a temperature between 1000° and 1600°F. No. 446,534 Houdry Process Corp. (Harry Boyer Weiser, Elgene Arthur Smith and Johnstone Sinnott Mackay).

Purifying zinc electrolyte by passing the electrolyte through a porous mass of finely divided precipitant for the impurities. No. 446,535. Hudson Bay Mining and Smelting Co., Ltd. (Charles Osborne Buchanan and Luther Glenn Hendrickson).

A solid catalyst consisting of a dehydrogenating oxide of a metal capable of existing in more than one stage of valence supported upon an aluminous base material having a preformed surface of lithium-aluminum spinel. No. 446,550 Shell Development Co. (Albert E. Smith and Otto A. Beeck).

Method of recovering chlorine from a mixture of gases comprises washing with water to dissolve chlorine and subjecting the chlorine solution to successive vaporization operations. No. 446,594. Air Reduction Co., Inc. (Frederick R. Balcar).

Manufacture of anhydrous magnesium chloride for the production of magnesium by electrolysis. No. 446,603. Canadian Industries, Ltd. (Leslie James Burrage and Alfred Mead).

Producing metal hydrides by heating a hydride-forming metal compound and aluminum. No. 446,632. Metal Hydrides Inc. (Peter P. Alexander).

Making an alkali metal oxide by spraying molten alkali metal into an atmosphere containing oxygen. No. 446,636. Mine Safety Appliances Co. (Carey B. Jackson).

Purifying anhydrous liquid halide of a metal of the fourth group which comprises contacting with elemental sulphur. No. 446,652. Pittsburgh Plate Glass Co. (Bernard Casper Meyers).

Method of reducing molybdenum trioxide with hydrogen. No. 446,732. Canadian Westinghouse Co., Ltd. (Robert F. Rennie).

Medicinal

Purifying crude penicillin, treating salt of penicillin in aqueous solution with diazotized aryl amine. No. 2,430,946. Richard Pasternack and Peter P. Regna to Charles Pfizer & Co., Inc.

Steroid compounds and method of preparing. No. 2,430,988. Russell Earl Marker and Eugene Leroy Wittle to Parke, Davis & Company.

Peripheral vasodilator composition for topical application comprising alkyl ester of nicotinic acid, having incorporated therein bland, high-boiling, adherent excipient. No. 2,431,558 Wolfgang Huber to Winthrop-Stearns Inc.

Extracting drugs soluble in mixture of water and organic solvent from drug-containing matter. No. 2,432,217. Marvin R. Thompson to William R. Warner & Co. Inc.

Canadian

Preparation of parasubstituted benzene-sulphonamide derivatives of pyridine, quinoline and thiazole. No. 446,464. Boots Pure Drug Co. (Mozes Juda Lewenstein).

Isomerizing and acylating the side chain attached to ring D of a steroidal sapogenin. No. 446,650. Parke, Davis & Co. (Russell Earl Marker).

Process for preparation of derivatives of p-amino-benzenesulfamides of the thiodiazol series. No. 446,679. Societe des Usines Chimiques Rhone-Poulenc St. Fons. (Rodolphe Leopold Mayer and Pierre Viaud).

Metals, Ores

Apparatus for forming test samples of electrolytic tin plate. No. 2,431,528. Arthur Forest Wells, Jr. and Paul Mackley.

Cleaning aluminum surfaces, comprising immersing article in bath containing predominant quantity of available molten ammonium fluoride for 5 seconds, at 240°F. No. 2,431,595. Wayne E. White to Aluminum Company of America.

Composite metal solder composed of alloy of silver, copper, zinc and cadmium. No. 2,431,611. George Durst to Metals & Controls Corporation.

Consolidating metal powder selected from molybdenum and tungsten to form dense coherent metal. No. 2,431,690. Roy D. Hall and John H. Ramage to Westinghouse Electric Corporation.

Consolidating refractory metal powder to dense coherent form. No. 2,431,691. William J. Newman to Westinghouse Electric Corporation.

Producing and recovering volatile pyrophoric metals from their oxides by thermic reduction with non-volatile reducing **agent.** No. 2,432,111. Hirsch Loevenstein to The Nitralloy Corporation.

Heat resistant alloy comprising 10% to 30% chromium, 0.001% to 0.5% alkaline earth metal, 0.01% to 0.5% thorium, balance nickel. No. 2,432,149. William Thomas Griffiths and Leonard Bessemer Pfeil to The International Nickel Company, Inc.

Canadian

Fabricating light metal by maintaining at the interface of tool and metal a boron-free metal fluoride and a compound selected from the class consisting of the oxyacids of boron and salts thereof. No. 446,375. Aluminum Co. of America (Lowrie Barnett Sargent, Jr. and Egbert Mason Kipp).

Method of producing chromium surfaces with fissure net-works by electrodepositing chromium under ratio of chromic acid to catalyst acid radicals and temperature for predisposing it to fissure net-work formation. No. 446,439. United Chromium, Inc. (Frank Passal).

Metal alloy comprising aluminum, copper and mercury ammoniate. No. 446,483. (Walter Ernest Crease).

Electrodepositing metals from alkaline baths by passing a plating current of abnormal wave through an alkaline plating bath. No. 446,548. Poor & Co. (Allan E. Chester).

Hard copper alloys consisting of copper, nickel and manganese. No. 446,602. Canadian Industries, Ltd. (Maurice Cook and William Oliver).

Copper alloys comprising copper, nickel manganese and aluminum. No. 446,604. Canadian Industries, Ltd. (Maurice Cook and William Oliver Alexander).

Organic

Preparation of tartaric acid free from oxalic acid and ash forming constituents comprises adding oxalic acid to liquid containing tartaric acid and minor quantity of ash forming constituent prior to crystallization of tartaric acid, separating precipitated oxalate, crystallizing tartaric acid. No. 2,430,855. William E. Barch to Standard Brands Incorporated.

Production of hydrocarbon peroxides. No. 2,430,864. Adalbert Farkas and Arthur F. Stribley, Jr. to Union Oil Company.

Stable water-insoluble saturated cyclic hydrocarbon hydroperoxide having formula R.OOH, where R is cyclopentyl group containing from one to two methyl groups. No. 2,430,865. Adalbert Farkas and Arthur F. Stribley, Jr. to Union Oil Company of California.

Preparation of ethylene-urea comprises heating ammonium carbonate with material selected from ethyleneglycol, ethylenediamine, and ethyleneoxide. No. 2,430,874. George C. Hale.

Tris-p-hydroxyphenyl ethylenes and process of manufacture. No. 2,430,891. Robert S. Shelton and Marcus G. Van Campen, Jr. to The Wm. S. Merrell Co.

Dehydrochlorinating compound selected from chlorinated palmitic acid, methyl esters of chlorinated palmitic acid, glyceryl esters of chlorinated palmitic acid, chlorinated stearic acid, methyl esters of chlorinated stearic acid and glyceryl esters of chlorinated stearic acid. No. 2,430,897. George R. Van Atta and David F. Houston.

Vegetable protein-polyphosphate compound in aqueous urea solution. No. 2,431,119. Artemy A. Horvath to Hall Laboratories, Inc.

Separation of acid constituent contained in liquid selected from cashew nutshell liquid and hydrogenated cashew nut shell liquid from toxic phenolic components of liquid. No. 2,431,127. Roland E. Kremers to General Foods Corporation.

Dicarbamates and process of making same. No. 2,431,140. Maurice Arthur Thorold Rogers to Imperial Chemical Industries Limited.

Synthesis of monoethyl benzene. No. 2,431,166. Charles Keith Buell and Robert Guy Boatright, Jr. to Phillips Petroleum Company.

Cobalt resinate of heat-treated rosin. No. 2,431,191. Paul R. Mosher to Hercules Powder Company.

Producing dry, solid, self-dispersing methylolstearamide. No. 2,431,202. Herbert L. Sanders to General Aniline & Film Corporation.

Production of 2-vinylfuran from 2-furanacrylic acid. No. 2,431,216. Cary R. Wagner to Phillips Petroleum Company.

Production of polymer of beta, gamma-olefinic alcohol. No. 2,431,224. Seaver A. Ballard to Shell Development Company.

Preparing 1-(dihydroxyphenyl)-2-amino butanol-1 and intermediates. No. 2,431,285. Chester Merle Suter and Arlo Wayne Ruddy to Winthrop-Stearns Inc.

Production of guanidine nitrate by fusion of ammonium nitrate with cyanamide salt. No. 2,431,301. George F. Wright to The Honorary Advisory Council for Scientific and Industrial Research.

Purifying vanillic acid containing acid fraction obtained by degradation of lignin substance. No. 2,431,419. Irwin A. Pearl to Sulfite Products Corporation.

Nitroolefine derivatives of malonic esters and process for preparing. No. 2,431,451. Carl T. Bahner.

Dialkyl ester of 2-methyl-4,5-dicarboxy pyridone-6. No. 2,431,463. Gustaf H. Carlson and Frederick J. Pilgrim to American Cyanamid Company.

Preparing unsaturated organic amide of formula described in patent. No. 2,431,468. Harold S. Davis, Myrl Lichtenwalter and Wolfgang M. Zeischke to American Cyanamid Company.

Aqueous solution of beta-diethylaminoethyl p-ethoxybenzoate hydrochloride containing salicyclic acid as stabilizing agent. No. 2,431,553. William F. Hamilton to Frederick M. Turnbull.

Purification of vinyl acetate by distillation and scrubbing distillate. No. 2,431,554. Virgil L. Hansley and Paul L. Magill to E. I. du Pont de Nemours & Co.

Production of mononitro derivatives comprises nitrating compound selected from benzene, toluene xylenes and ethylbenzene in vapor phase using nitrating agent selected from nitric acid and nitrogen dioxide, and catalyst selected from metal metaphosphates and boron phosphate. No. 2,431,585. Alfred Edgar Rout to Imperial Chemical Industries Limited.

Preparing aromatic guanides comprises dissolving member of group consisting of aromatic acyl dicyandiamides and ammonium and primary amine salts thereof in solvent, heating at 60°C until aromatic guanide. No. 2,431,644. Donald W. Kaiser to American Cyanamid Company.

Decolorizing aromatic hydrocarbons. No. 2,431,655. James L. Amos and Kenneth E. Stober to The Dow Chemical Company.

Preparing epoxides of unsaturated ketones. No. 2,431,718. Richard S. Wilder and Arthur A. Dolnick to Publicker Commercial Alcohol Company.

Dehydrating ketones comprises reacting alkyl ketone at 100°C to 450°C in presence of aqueous solution of ammonium chloride. No. 2,431,754. Vladimir N. Ipatieff and Carl B. Linn to Universal Oil Products Company.

Producing from rosin nonsiccative oily composition of matter, consisting of decarboxylating and partly dehydrogenating resin at 200° to 300°C with 1% sulphur, and ferric oxide in presence of air, purifying product by distilling. No. 2,431,788. Roger Septime Auguste and Jean Philippe Simon Vallee to "Chimiotechnic" Union Chimique du Nord et du Rhone, Societe Anonyme.

Bleaching a substance selected from ester-type waxes and ester-type oils. No. 2,431,842. Ernest Stossel and Ernest Zerner to The Mathieson Alkali Works, Inc.

Reacting lumazine with strongly concentrated sulfuric acid at 180-245°C, recovering 2-amino-pyrazine. 2,431,896. John Weijlard and Max Tishler and Arthur E. Erickson to Merck & Co., Inc.

N-benzenesulfonyl-2-amino-2'-methoxy-1,1'-dinaphthylmethane represented by formula described in patent. No. 2,431,909. Elkan R. Blout and Richard S. Corley to Polaroid Corporation.

N-acetyl-1-(2'-naphthylaminomethyl)-2-naphthol represented by formula described in patent. No. 2,431,910. Elkan R. Blout and Richard S. Corley to Polaroid Corporation.

N-acetyl-O-methyl-1-(2'-naphthylaminomethyl)-2-naphthol. No. 2,431,911. Elkan R. Blout and Richard S. Corley to Polaroid Corporation.

N-benzenesulfonyl-O-methyl-1-(2'-naphthylamino-methyl)-2-naphthol. No. 2,431,912. Elkan R. Blout and Richard S. Corley to Polaroid Corporation.

New chemical compound, liquid at normal temperature and having boiling point at normal atmospheric pressure of 75°C, density of 1.67, refractive index of 1.32, having molecular formula C_6ClF_9. No. 2,431,969. William S. Struve.

2-substituted furan-3,4-dicarboxylic acids their corresponding saturated analogues and derivatives thereof. No. 2,432,016. Klaus Hofmann to Ciba Pharmaceutical Products, Inc.

Producing N,N bis-(beta-hydroxy alkyl)-arylamine of benzene and naphthalene series, by reaction of alkylene oxide on corresponding primary amine. No. 2,432,023. Hans Z. Lecher and Martin L. Kesler to American Cyanamid Company.

Chromium complexes of 1-phenyl-5-methyl-3-pyrazolone azo compounds. No. 2,432,034. Abby Ware Nies to American Cyanamid Company.

Obtaining metacresol-2,6-lutidine consists in mixing 2,6-lutidine and mixture consisting of metacresol and paracresol with metacresol predominating, producing in mixture low temperature to form crystals of metacresol-2,6-lutidine. No. 2,432,062. Francis E. Cislak and Merritt M. Otto to Reilly Tar & Chemical Corporation.

Obtaining compound of paracresol and pyridine base of class consisting of 4-picoline, quinaldine, 2,3,6-collidine, and 2,4-dimethylquinoline. No. 2,432,063. Francis E. Cislak and Merritt M. Otto to Reilly Tar & Chemical Corporation.

Purifying quinaldine consists in mixing crude quinaldine with mononuclear tar acid having producing in mixture low temperature to form crystals of compound of tar acid with quinaldine, separating crystals, chemically decomposing crystals to liberate quinaldine. No. 2,432,064. Francis E. Cislak and Merritt M. Otto to Reilly Tar & Chemical Corporation.

Purifying isoquinoline, consists in mixing crude isoquinoline with tar acid of class consisting of phenol and beta-naphthol, producing in mixture low temperature to form crystals of compound of tar acid with isoquinoline, separating crystals, chemically decomposing crystals to liberate isoquinoline. No. 2,432,065. Francis E. Cislak and Merritt M. Otto to Reilly Tar & Chemical Corporation.

Continuous method for producing Xylidine by catalytic reduction of nitroxylene. No. 2,432,087. Cecil L. Brown to Standard Oil Development Company.

Continuously reducing aromatic nitro compounds to corresponding aromatic amines. No. 2,432,099. Charles N. Kimberlin, Jr. to Standard Oil Development Company.

Preparation of oxo carbonyl compounds. No. 2,432,287. Richard D. Cramer to E. I. du Pont de Nemours & Company.

Stabilizing or deactivating sludges, precipitates and residues occurring or used in manufacture of tetraalkyl leads. No. 2,432,321. Adrian L. Linch to E. I. du Pont de Nemours & Company.

Separating rosin acids from mixture of rosin and higher fatty acids. No. 2,432,332. Robert C. Palmer to Newport Industries, Inc.

Increasing rosin-to-fatty acid ratio in mixtures of rosin and fatty acids. No. 2,432,333. Robert C. Palmer and Anthony F. Oliver to Newport Industries, Inc.

Alkylation of short chain alkyl-substituted aromatic hydrocarbons. No. 2,432,381. Donald D. Coffman and John R. Roland to E. I. du Pont de Nemours & Company.

1-Acyloxy-2-alkylbutadiene-1,3 compounds. No. 2,432,394. Joseph B. Dickey and Clarence G. Stuckwisch to Eastman Kodak Company.

Amides and their manufacture. No. 2,432,438. Alfred Ofner and Joseph D. Surmatis to Hoffmann-La Roche, Inc.

Synthesis of saccharosonic acids and salts thereof. No. 2,432,439. Joseph D. Surmatis and Alfred Ofner to Hoffmann-La Roche, Inc.

Separating conjugated diolefin having 4-5 carbon atoms per molecule from hydrocarbon mixture containing same together with less unsaturated hydrocarbons. No. 2,432,458. Herbert C. Thober and Rolland G. Bowers to Sun Oil Company.

Oil wetting water wetting carbon black composition. No. 2,432,461. Vincent C. Vesce to Harmon Color Works, Inc.

Converting dichlorsuccinic anhydride to monochloromaleic anhydride. No. 2,432,470. Albert M. Clifford to Wingfoot Corporation.

Synthesis of carboxylic acids. No. 2,432,474. William F. Gresham to E. I. du Pont de Nemours & Company.

Canadian

Process for splitting-off hydrogen chloride from chlorinated hydrocarbons containing 2 or 3 carbon atoms and containing the group—CHCl-CHCl. No. 446,391. The Distillers Co., Ltd. (Martin Mugdan and Derek Harold Richard Barton).

Purification of crude acetaldol by distilling crude acetaldol vacuo. No. 446,392. The Distillers Co., Ltd. (Karl Heinrich Walter Tuerck and Hans Joachim Lichtenstein).

Manufacture of ethyl chloride by reacting gaseous hydrogen chloride with a preformed sulphuric ester of ethyl alcohol in the presence of a catalyst of the class consisting of compounds of antimony, tin and bismuth. No. 446,393. The Distillers Co., Ltd. (Eugen Gottfried Galitzenstein and Cyril Woolf).

Recovering theobromine from its aqueous solutions by adsorbing on clay. No. 446,398. General Food Corp. (Roland E. Kremers).

Preparing a 2-sulpholiphatic guanamine by reacting a biguanide with an ester of a sulphonated aliphatic carboxylic acid No. 446,462. American Cyanamid Co. (Jack Theo Thurston).

Preparing an N-heterocyclic guanamine by reacting an N-heterocyclic biguanide with an ester of a carboxylic acid. No. 446,463. American Cyanamid Co. (Jack Theo Thurston).

Phenol is reacted with a ketone in the presence of sulphur and sulphur compounds. No. 446,523. Dow Chemical Co. (Ralph P. Perkins and Fred Bryner).

Manufacture of lactams by heating oximes of cyclic ketones derived from cyclo-paraffinic hydrocarbons with concentrated sulphuric acid in admixture with glacial acetic acid. 446,564. (Robert Wighton Moncrieff and Donald Peter Young).

Process for isolating dehydrocholic acid by dissolving in a tertiary aliphatic alcohol. No. 446,599. Armour & Co. (Robert H. Sifferd).

Organic isocyanates from phosgene and a primary amine hydrochloride. 446,606. Canadian Industries, Ltd. (Edward Burgoine, Benjamin Collie and Randal George Arthur).

Hexamethylene dissocyanate by reacting hexamethylenediamine dihydrochloride with phosgene. No. 446,607. Canadian Industries, Ltd. (Edward Burgoine and Randal George Arthur).

Reducing 2-amino-4-chloropyrimidine to 2-aminopyrimidine with metallic zinc under alkaline conditions. No. 446,710. American Cyanamid Co. (Edwin Kuh and Martin Everett Hultquist).

Reducing 2-amino-4-chloropyridine to 2-aminopyrimidine with metallic zinc under alkaline conditions in the presence of ammonium ion. No. 446,711. American Cyanamid Co. (Elmore Hathaway Northey).

2-amino-4-chloropyrimidine from phosphorus oxychloride and isocytosine in the presence of a small amount of chlorsulphonic acid. No. 446,712. American Cyanamid Co. (Martin Everett Hultquist and Edwin Kuh).

Recovering 2-aminopyrimidine by reacting the 2-aminopyrimidine in solution with sulphur dioxide. No. 446,713. American Cyanamid Co. (Erwin Kuh).

Reducing a chloropyrimidine by metallic zinc in the presence of a water insoluble surface active material. 446,714. American Cyanamid Co. (Erwin Kuh).

Oxidizing a solution of a 2-alkyl-3-alkoxy-4,5-di (hydroxymethyl) pyridine by barium permanganate to produce the lactone of 2-alkyl-3-alkoxy-4-hydroxymethyl-5-carboxypyridine. No. 446,773 Merck & Co., Inc. (Eric T. Stiller).

Packaging

Expansible container to hold liquid and withstand increased pressure of liquid on walls when liquid loaded container is subjected to rapid change of motion. No. 2,430,905. Wayne D. Bradley to United States Rubber Company.

Container for storage or shipment of high octane motor fuels comprised of laminated walls comprising as essential laminae, film of a partial acetal of polyvinyl alcohol in which from 12% to 55% of available hydroxyl groups of polyvinyl alcohol are combined with aliphatic aldehyde containing from one to six carbonatoms, layer of compounded rubber-like vulcanizable butadiene copolymer, layer of natural gum rubber. No. 2,430,931. Albert Hershberger to E. I. du Pont de Nemours & Company.

Laminated product comprising at least two laminae bonded by composition comprising N-alkoxymethyl polyamide. No. 2,430,933. Fred W. Hoover to E. I. du Pont de Nemours & Company.

Means for closing open end of container of type having outwardly indented circumferential groove positioned parallel to open end. No. 2,430,967. Arthur B. Walters.

Heat sealing laminated materials. No. 2,431,050. Karl J. Kopplin.

Light-weight gas-impervious laminated composition. No. 2,431,056. Oscar W. Loudenslager and Joseph E. Wilson to Wingfoot Corporation.

Method and apparatus for making end closures for tubular containers. No. 2,431,537. Boris Bogoslowsky.

Forming flat-folded paperboard packages. No. 2,432,053. Harry F Waters.

Continuously producing fluidtight package blanks. No. 2,432,054. Harry F. Waters.

Printing dispenser for pressure-sensitive adhesive coated tape. No. 2,432,202. Edwin W. Mason.

Making containers in succession from continuous web of sheet material before separation of container therefrom simultaneously producing partial vacuum within container and externally thereof, during production of partial vacuum filling container, sealing container. No. 2,432,373. Edgar W. Bleam and Jonathan Y. Albertson to Stokes and Smith Company.

Canadian

Multi-ply bag, the outer ply formed of paper enveloping a liner ply of fluid-impervious material. No. 446,436. St. Regis Paper Co. (Edgar Boris Hoppe).

Paper, Pulp

Canadian

Manufacturing paper by increasing fibrillation and hydration of the pulp fibres. No. 446,608. Canadian Industries Ltd. (Edgar Fajans, Frederick Hamilton, Fred North and Henry Samuels).

Process forming soft fibrous board from the bark of coniferous trees, and impregnating with animal glue, treating the glue impregnated board with formaldehyde and then hot pressing. No. 446,696. (Alfred G. Jacques).

Petroleum

Foam inhibited mineral oil, comprising major quantity of excessively foaming mineral oil of lubricating viscosity, minor quantity, to inhibit foaming, of compound which contains not less than 15% by weight of oxygen, has molecular weight not higher than 270, and is represented by formula A(X)a (OR)b wherein A is an aromatic nucleus, X an oxygen-containing substituent, R a member of class consisting of hydrogen, alkyl, cycloalkyl, aryl and aralkyl radicals, a and b are integers. No. 2,430,857. Victor N. Borsoff and James O. Clayton to California Research Corporation.

Compounded hydrocarbon lubricating oil comprising major proportion of hydrocarbon oil of lubricating viscosity, small amount of metal salt selected from oil-soluble metal salts of organic acids and oil-soluble metal salts of organo-substituted inorganic acids, and small amount, to inhibit foaming of oil of aliphatic compound. No. 2,430,858. Victor N. Borsoff and James O. Clayton to California Research Corporation.

Improvement in desorbing diolefin from ammoniacal cuprous salt solution having addition compounds of cuprous salt and diolefin therein. No. 2,430,972. Norman F. Black and Louis E. Pirkle to Standard Oil Development Company.

Isomerizing paraffinic hydrocarbons. No. 2,430,979. Otto Gerbes to Standard Oil Development Company.

Stabilizing sulfur and sulfur compounds in crude petroleum comprises adding cuprous naphthenate in proportion to convert unstable sulfur compounds into stable sulfur compounds, to crude petroleum. No. 2,430,981. Charles O. Hoover to Air Reduction Company, Inc.

Producing hydrocarbon gases substantially free from hydrogen sulfide, mercaptans and disulfides. No. 2,430,982. Charles O. Hoover to Air Reduction Company, Inc.

Separating and concentrating isobutene from mixture of hydrocarbons. No. 2,431,005. Earl E. Willauer and Insley P. Jones to Standard Oil Development Co.

Carrying out high speed grinding operations in which abrading wheel rotates at high speed against metal stock comprises applying to metal at point of abrasion viscous lubricant comprising major portion of nontoxic, non-corrosive volatile, low viscosity petroleum hydrocarbon liquid. No. 2,431,008. Donald L. Wright to Standard Oil Development Company.

Petroleum product cracking apparatus. No. 2,431,060. Frank E. Mason.

Cracking hydrocarbon oils. No. 2,431,206. William E. Spicer and Jerry A. Pierce to Standard Oil Development Company.

Conversion of hydrocarbon oils boiling above gasoline boiling range into anti-knock gasoline and other valuable products. No. 2,431,243. Bernard S. Greensfelder, Hervey H. Voge and George M. Good to Shell Development Company.

Treatment of butadiene compound with contact mass of fused alumina. No. 2,431,403. Herbert L. Johnson, Hans G. Voelker and Archibald P. Stuart to Sun Oil Company.

Preparing olefin polymers which boil without decomposition within range of 93.3C. to 343°C. from higher molecular weight olefin polymers. No. 2,431,454. Henry Berk and David W. Young to Standard Oil Development Company.

Catalytic treatment of hydrocarbons. No. 2,431,462. Donald L. Campbell and Homer Z. Martin to Standard Oil Development Company.

Converting hydrocarbons. No. 2,431,485. William O. Keeling.

Removal of finely divided solid catalyst from liquid hydrocarbon oil. No. 2,431,499. **Jewell S. Palmer to Standard Oil Development Company.**

Alkylation process of type wherein liquid isoparaffin, liquid olefin, and hydrofluoric acid catalyst are fed into inlet of single-pass reaction zone, etc. No. 2,431,500. Joe E. Penick to Socony-Vacuum Oil Company, Inc.

Producing aviation gasoline blending stock comprises catalytically hydroforming naphtha so that there is no net consumption of hydrogen, etc. No. 2,431,515. Robert M. Shepardson to Standard Oil Development Company.

Reconstructing low-boiling aliphatic olefin to form low-boiling nonolefin hydrocarbons. No. 2,431,549. Frederick E. Frey to Phillips Petroleum Company.

Regenerating fluidized heat resistant solid catalytic contacting material by burning hydrocarbonaceous deposits therefrom and by stripping residual regeneration products from contacting material by means of steam. No. 2,431,630. Maurice H. Arveson to Standard Oil Company. (Ind.).

Recovery of oils from shales. No. 2,431,677. Harry D. Brown.

Improved process for reacting olefin with alkylatable organic compound in presence of hydrofluoric acid alkylation catalyst. No. 2,431,685. George N. Cade to Phillips Petroleum Company.

Catalytic hydrocarbon conversion process wherein admixture of hydrocarbons and catalyst comprising hydrogen fluoride is passed through system of apparatus. No. 2,431,715. Aaron Wachter to Shell Development Company.

Isomerizing cyclic-monoolefinic hydrocarbon. No. 2,431,755. Vladimir N. Ipatieff and Herman Pines to Universal Oil Products Company.

Sweetening mercaptan-containing petroleum distillates. No. 2,431,770. Donald E. Payne and Vanderveer Voorhees to Standard Oil Company.

Composition for demulsifying petroleum oils and removing and preventing sludge formation. No. 2,431,792. Nicholas J. Datesh and John N. Datesh.

Improvement of cracked gasolines and similar hydrocarbon distillates containing sulfur compounds equivalent to more than 0.10% sulfur. No. 2,431,920. Robert M. Cole to Shell Development Company.

Dealkylation of substituted aromatic hydrocarbon other than monomethyl aromatic hydrocarbon. No. 2,431,940. Robert M. Kennedy and Stanford J. Hetzel to Sun Oil Company.

Producing octanes from propylene and isobutane. No. 2,432,030. Maryan P. Matuszak to Phillips Petroleum Company.

Break-in fuel for internal combustion engines to reduce break-in time consisting of hydrocarbon fuel for engines saturated with monomeric lower tetra alkyl orthosilicate. No. 2,432,109. William A. Zisman, Hayward R. Baker and Charles M. Murphy, Jr.

Continuous process for recovering oil from shale. No. 2,432,135. Frank T. Barr to Standard Oil Development Company.

Catalytic cracking of hydrocarbon oil to produce valuable normally gaseous and normally liquid hydrocarbon products of lower molecular weight and boiling point using fluidized finely divided cracking catalyst. No. 2,432,277. John M. Brackenbury to Shell Development Company.

Producing high quality motor fuel component. No. 2,432,281. Hamilton P. Caldwell, Jr. to Socony-Vacuum Oil Company, Inc.

Thermal cracking of hydrocarbons. No. 2,432,298. Sylvander C. Eastwood and Louis P. Evans to Socony-Vacuum Oil Company, Inc.

Conversion of liquid hydrocarbons in presence of compact column of moving particle-form solid contact material. No. 2,432,344. Edward L. Sinclair to Socony-Vacuum Oil Company, Inc.

Separation of hydrogen fluoride from hydrocarbons by distillation and partial condensation. No. 2,432,405. Clarence G. Gerhold to Universal Oil Products Company.

Separating ethylene of higher purity from gaseous mixture containing from 10 to 95% ethylene. No. 2,432,423. Edward Hunter to Imperial Chemical Industries Limited.

Manufacture of lubricating oil of superior oxidation stability adapted for turbine oil. No. 2,432,440. John A. Patterson to The Texas Company.

Alkylation process comprises alkylating isoparaffin with olefin in presence of hydrofluoric acid as catalyst, etc. No. 2,432,482. Maryan P. Matuszak to Phillips Petroleum Company.

Additional patents from the above volumes will be given next month.

Trademarks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

434,632. International Chem. Co., Chicago, Ill., filed Feb. 26, 1945; Serial No. 480,246; for self-polishing wax; since Jan. 1, 1936.
434,751. Wm. T. Knott Company, Inc., New York, N. Y., filed Sept. 28, 1945; Serial No. 489,125; for paint products; since Sept. 1, 1945.
435,157. D. H. Buster Chemical Company, Kansas City, Mo., assignor to V. Jack Vincent, Lawrence, Kans., filed June 12, 1942; Serial No. 453,612; for liquid wax; since Mar. 1, 1942.
435,161. Kemical Products Co., Inc., Springfield, Mass., filed Apr. 26, 1946; Serial No. 500,986; for fabric and hand cleaner; since Dec. 18, 1944.
481,063. General Chem. Co., N. Y., N. Y., filed Mar. 1, 1945; for reagent chemicals since Feb. 1, 1945.
487,071. Container Corporation of America, Chicago, Ill., filed Aug. 13, 1945; for paperboard shipping containers; since July 19, 1945.
493,601. Industrial Synthetics Corp., Irvington, N. J., filed Dec. 20, 1945; for rods, tubes and partly prepared articles of rubber, synthetic rubber or plastics; since Dec. 1943.
496,654. Park Chemical Co., Detroit, Mich., filed Feb. 15, 1946; for shock absorber oil, fluid, etc.; since March 1939.
497,955. Monsanto Chemical Company, St. Louis, Mo., filed Mar. 9, 1946; for inorganic phosphates; since Jan. 4, 1946.
500,782. Valley Chemical Company, Inc., Springfield, Mass., filed Apr. 23, 1946; for preparation for removing rust and carbon from automobile radiators, etc.; since Feb. 5, 1946.
504,568. The Lubrizol Corporation, Wickliffe, Ohio, filed June 25, 1946; for chemical compounds since Oct. 1, 1937.
505,430. Frank D. McBride, doing business as American Solder & Flux Co., Philadelphia, Pa., filed July 11, 1946; for abrasive welding soldering flux, soldering salts, and sal-ammoniac; since 1926.
505,581. Harvel Research Corporation, Irvington, N. J., filed July 13, 1946; for synthetic resins; since May 29, 1946.
507,157. Tex Products, Inc., Newark, N. J., filed Aug. 9, 1946; for synthetic resins; since July 12, 1946.
507,165. Vita-Var Corp., Newark, N. J., filed Aug. 9, 1946; for insecticide; since July 12, 1946.
508,289. Oscar E. Honig as Amaco Lab. Amarillo, Tex., filed Aug. 30, 1946; for industrial, reagent chemicals; since July 20, 1946.
510,722. Plunkett Trust, Chicago, Ill., filed Oct. 11, 1946; for detergent with antiseptic properties; since Mar. 16, 1944.
511,552. Glyco Prod. Co. Inc., N. Y., filed Oct. 26, 1946; for emulsifying agent; since May 31, 1946.
512,194. Monsanto Chem. Co., St. Louis, Mo., filed Nov. 7, 1946; for chemical products containing substituent zinc 8-quinolinolate for combating insects, fungi; since Oct. 2, 1946.
512,669. Hemisphere Trading Company, Inc., New Orleans, La., filed Nov. 15, 1946; for petroleum lubricating grease and lubricating oil; since Oct. 9, 1944.
513,453. Ohio-Apex, Inc., Nitro, W. Va., filed Nov. 29, 1946; for bulk chemical; since September 1936.
513,615. Dunlop Tire and Rubber Corp., Buffalo, N. Y., filed Dec. 3, 1946; for lubricating oil and motor tune-up oil; since Oct. 8, 1946.
513,786. The U. S. Stoneware, Co., Akron, Ohio, filed Dec. 5, 1946; for synthetic thermoplastic resinous materials; since May 1940.
514,036. Hercules Powder Co., Wilmington, Del., filed Dec. 11, 1946; for active chemical ingredient in insecticides; since Dec. 4, 1946.
514,061. Fred R. Packer, New York, N. Y., filed Dec. 11, 1946; for preformed plastic floor covering; since Oct. 21, 1946.
514,807. Dow Corning Corp., Midland, Mich., filed Dec. 26, 1946; for compositions in physical character comparable to milled and compounded rubber prior to vulcanization but containing organosilicon polymers; since July 1945.
514,823. Koch Laboratories, Inc., Winona, Minn., filed Dec. 26, 1946; for chemical preparation for removing spots; since June 1946.
515,092. Essex Paper Mills, Inc., N. Y., N. Y., filed Dec. 31, 1946; for lethal fly and moth lures coated with DDT; since Dec. 17, 1946.
515,137. Sun Chemical Corporation, New York, N. Y., filed Dec. 31, 1946; for material for use in processing of textiles; since Aug. 14, 1946.
516,236. Ernest H. White, as Hudson Chemical Company, Sheridan, Mich.; filed Jan. 23, 1947; for compound to prevent spontaneous combustion, moulding, mildewing, rotting and spoilage of hay, grain, etc.; since Feb. 19, 1946.
516,596. John M. Bash, as Phillips Chemical Co., Chicago, Ill., filed Jan 30, 1947; for liquid air-freshening deodorant; since Dec. 26, 1946.
516,656. American Oil and Disinfectant Corp., N. Y., N. Y., filed Jan. 31, 1947; for chemically neutral aqueous paste containing sulfonated fatty acid amide, as spot remover and detergent; since Sept. 1941.
517,123. Freedom-Valvoline Oil Company, Freedom, Pa., filed Feb. 7, 1947; for lubricating oils and greases; since June 1873.
520,170. Samuel T. Kantor, doing business as Gotham Ink & Color Co., L. I. C., N. Y., filed Apr. 4, 1947; for rotogravure inks; coatings and varnishes for application; since June 5, 1946.
520,961. Newport Industries, Inc., Pensacola, Fla., filed Apr. 18, 1947; for polymerized or partially polymerized rosin; since Nov. 10, 1941.
520,962. Newport Industries, Inc., Pensacola, Fla., filed Apr. 18, 1947; for high melting rosin since Sept. 18, 1931.
520,963. Newport Industries, Inc., Pensacola, Fla., filed Apr. 18, 1947; for high melting pale rosin; since Feb. 16, 1933.
520,964. Newport Industries, Inc., Pensacola, Fla., filed Apr. 18, 1947; for B grade wood resin; since Feb. 21, 1945.
520,965. Newport Industries, Inc,. Pensacola, Fla., filed Apr. 18, 1947; for limed rosin; since Mar. 23, 1932.
520,980. Standard Oil Co. of Calif., Wilmington, Del., and San Fran., Calif., filed Apr. 18, 1947; for cleaning solvents; since Feb. 3, 1947.
521,433. Chemical Service of Baltimore, as The Chemical Service Company, Baltimore, Md., filed Apr. 28, 1947; for detergents and cleaning preparations; since October 1940.
521,839. Ultra Chemical Works, Inc., Paterson, N. J., filed May 3, 1947; for surface active agents; since Nov. 29, 1946.
522,078. The National Plastic Products Company, Odenton, Md., filed May 8, 1947; for plastic bristles; since Aug. 14, 1946.
523,308. Ferrubron Metal Paint Company, Milwaukee, Wis., filed May 31, 1947; for anti-rust and acid-resistant paint; since May 21, 1898.
525,192. Chemola Manufacturing Company, Houston, Texas, filed June 30, 1947; for insect repellent; since June 27, 1947.
Patent Office, November 18 - December 9.

Trademarks reproduced and described include those appearing in Official Gazette of U. S. Patent Office, November 18-December 9.

WEAR WELL
434,632

CROMWELL
434,751

Sup-R-GlosS
435,157

Kem
Kemical Products Co., Inc.
435,161

BA
481,063

DUO-ARCH
487,071

ELASTRO
493,601

Parko
496,654

PETROFOS
497,955

VALCHEMCO
500,782

ANGLAMOL
504,568

AMCO
505,430

FURETONE
505,581

SUPER-TEX
507,157

VITA-GAS
507,165

A M C O A
508,289

PAM
510,722

ALDO
511,552

ZINC-8
512,194

HEMISFERIO
512,669

PLASTICIZERS & CHEMICALS
OHIO APEX INC
NITRO, W. VA.
513,453

GOLD CUP
513,615

RESILON
513,786

TOXAPHENE
514,036

Vinyoleum
514,061

SILASTIC
514,807

BLITZ
514,823

PARAFLY
515,092

WARCOPLEX
515,137

SECURITY COMPOUND
FOR THE PRESERVATION OF FARM CROPS
HUDSON CHEMICAL CO.
SHERIDAN, MICH.
516,236

WISP-AIR
516,596

GLO-WASH
516,656

VALVOLINE
517,123

MIROTO
520,170

PENROS
520,961

HYROS
520,962

HYREX
520,963

PENBRO
520,964

FOSFO
520,965

RPM
520,980

ALKATROL
521,433

NEOPONE
521,839

Wynene
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